DOCUMENT RESUME

ED 026 275 SE 006 270

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Introducing Children to Space, the Lincoln Plan. A Space Handbook for Teachers Grades K through 6.

Lincoln Public Schools, Nebr.

Spons Agency-National Aeronautics and Space Administration, Washington, D.C. Educational Programs Div.

Report No-EP-36

Pub Date [63]

Note-167p.

Available from-Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 ($1.25)

EDRS Price MF-$0.75 HC-$8.45

Descriptors-*Aerospace Technology, Bibliographies, *Earth Science, *Elementary School Science, Instructional Materials, Science Activities, *Teaching Guides

Identifiers-National Aeronautics and Space Administration

This handbook for space science was developed for use by elementary school teachers of grades K-6. The instructional plan of this guide presents activities for students of various maturity levels--five through eleven years. Teachers are encouraged to use the materials to meet the needs of individuals in the class. Most of the activities included were successfully pretested. All of them are correlated with an aerospace "bookshelf" composed of books and instructional materials. For each activity presented, suggestions are made as to how the material can be integrated with other subject matter areas such as language arts, social studies, and art. A bibliography of instructional materials and addresses of material publishers are included. (BC)

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INTRODUCING CHILDREN TO SPACE

THE LINCOLN PLAN

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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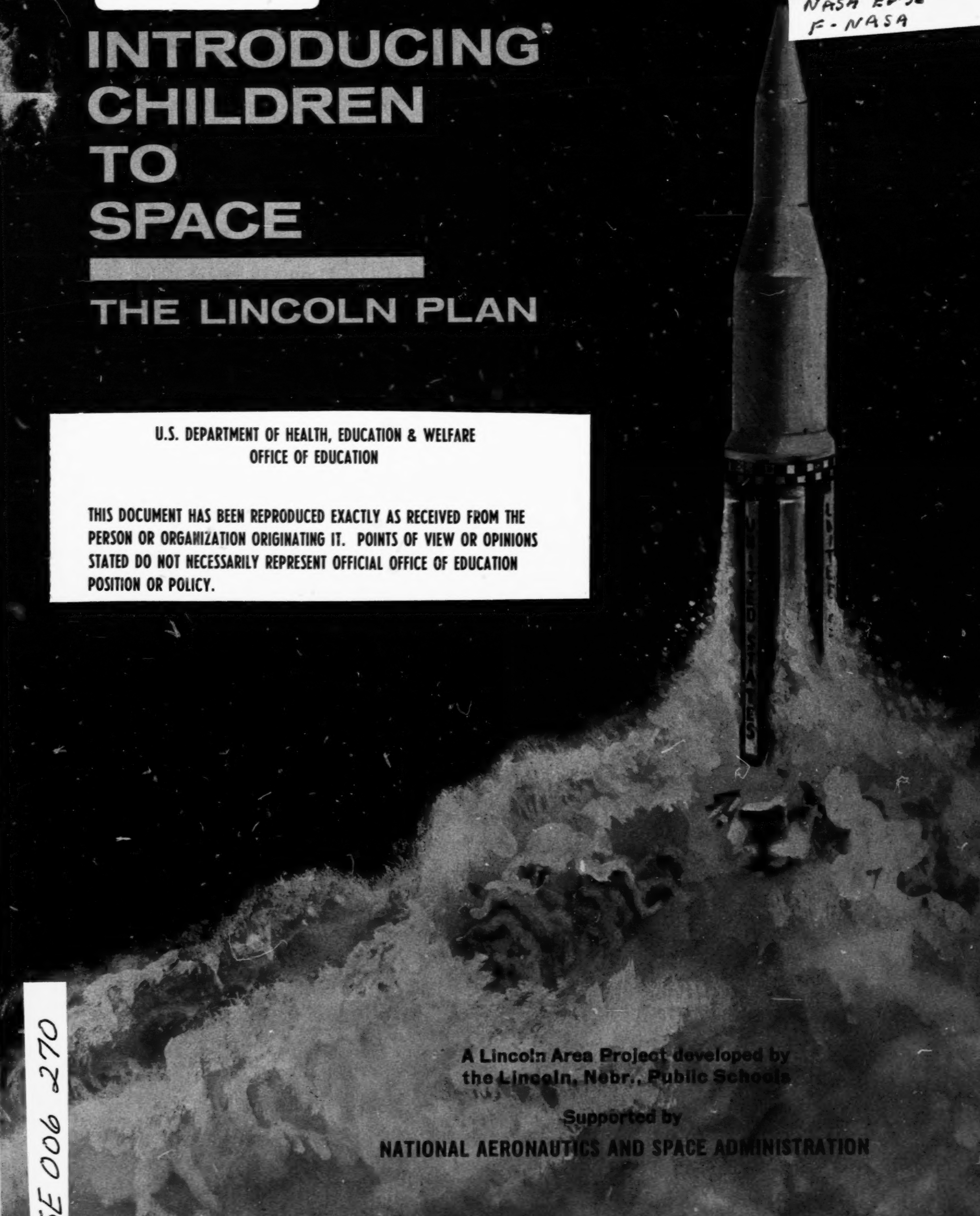

A Lincoln Area Project developed by
the Lincoln, Nebr., Public Schools

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SE 006 270

Above all gifts
Bestow'd by flight
Have seemed to me
The vistas fraught
With mystery.

No bold heart mind
To disdain doubt
And feel no fear
Of what's athwart
The course I steer.

'Tis only mine
To lean on faith
That I will learn
Beyond my doubts
Which way to turn.

And thus it is
The vistas fraught
With dark unknowns
Have prov'n to be
The stepping stones.

GILL ROBB WILSON
Flying Magazine
September 1962

Introducing Children to Space

THE LINCOLN PLAN

A SPACE HANDBOOK FOR TEACHERS
GRADES K THROUGH 6

FEATURING:
MATURITY LEVELS
FIVE THROUGH ELEVEN YEARS

A Report on
A Lincoln Area Project, developed by
the Lincoln, Nebr. Public Schools

To

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Office of Public Affairs, Educational Programs Division

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 Price $1.25

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Acknowledgments

The Lincoln Plan of space orientation for children enrolled in grades K through 6 is an important part of a larger program of air-space education conceived and implemented by the Lincoln Public Schools working in close cooperation with the University of Nebraska Teachers College, the Nebraska Department of Aeronautics, the National Aeronautics and Space Administration and other air-space oriented state and federal agencies. This larger program, enveloped by air-space discoveries, is a major force in curriculum development in the Lincoln school system. Acknowledgment is hereby given to all Lincoln school personnel engaged in this pioneering effort.

The Lincoln program of air-space teaching is greatly enhanced because of the competent assistance provided by the national and regional staffs of NASA's of Educational Programs Division, as well as the financial support given by the agency. This assistance has given depth and breadth to the Lincoln air-space education experiment.

Especially helpful in carrying forward this air-space educational emphasis has been the University of Nebraska Teachers College Aerospace Education Division which has received assistance over a period of years from the Nebraska Department of Aeronautics and the Link Foundation. The Lincoln Public Schools are grateful for this assistance.

STEVEN N. WATKINS
Superintendent of Schools
Lincoln, Nebraska

This is Space Education

The achievements identified with the Space Age may frustrate grandparents and even parents—not so their children. They travel in thought and in spirit with the pilots who fly the rocket-powered X–15 spaceship. They follow carefully projects such as Mercury, Gemini, and Apollo, for they know that these projects will produce the magic carpets which will carry man into space, to the moon, and to other planets. These space-minded young people make up the population in our schools today.

In order to satisfy the space interests of these learners, teachers may find it helpful to organize instruction into three dimensions: namely, earth, air, and space—with earth as the center of the wheel of instruction.

Let us consider these three dimensions as a basis for planned instruction:

First, Earth.—For many, many years, in classrooms across the nation, teachers have presented the earth as the home of man. The earth provides the food he eats, the clothes he wears, and the house he lives in. The earth will continue to be the stage upon which the peoples of the world perform their day-to-day activities. As a matter of convenience, these peoples have grouped themselves into nations, thus establishing a world pattern of political units. The major problem facing education today, as has been true in the past, is to organize a system of instruction geared to the concept of emerging, rather than static, nations. With each new year, the learner's understanding of the nations of the world should expand in breadth and depth. Thus, education becomes global in character and dynamic in composition.

As a point of departure, teachers are encouraged to ask themselves the question, "How extensive is the children's study of their earth?" Do they, for example, think of the earth as a satellite? Are they familiar with the motions of the earth that establish day and night and the four seasons? Do they have adequate mental pictures of the continents of the earth and of the vast oceans which surround these continents? Do they recognize the oceans as large areas of inner space with many resources yet to be discovered? In their day-to-day studies, do the children take classroom journeys to important places in the United States and in nations across the seas? Do the children understand that living and working conditions in each nation are constantly changing and the reasons for these changes? Are you using globes, world maps, world trade information, and other teaching aids which stimulate thinking on a worldwide basis? Can the children in the schools of your State express themselves effectively on such problems as the elimination of ignorance, disease, and poverty?

Second, Air.—Would it not seem strange today to live in a world without airports, without airplanes, or without worldwide systems of air transportation and communication?

With each new year, more and more persons are traveling the air routes across the Nation and around the world. As evidence of this, you are invited to have your students study the vast activities of citizens who can be found at almost any hour of the day or night in the airports of such cities as New York, London, Paris, Rome, Calcutta, Bangkok, Manila, Tokyo, Honolulu, and San Francisco, as well as the dozens of cities that serve your community and region. A companion study certainly worthy of teacher and student consideration might provide for a careful analysis of the flight schedules of the world's airlines. An equally important, but perhaps less difficult educational procedure might well be a weekly current review of aviation activities reported in the local newspapers and the weekly and monthly magazines.

There is much evidence to show that man's use of the air environment will continue to expand. Flying at Edwards Air Force Base are the new experimental airplanes, including the X–15, the XB–70, the F–111, and the XV–142. These airplanes promise advances in both civilian and military aviation almost beyond the comprehension of man. Why not encourage students in their classes in science, social science, or in almost any subject to undertake studies of these cutting-edge aviation projects designed to bring the benefits of the air dimension to the world community of nations?

Third, Space.—In a recent edition of NASA's publication entitled *Space . . . the New Frontier*, President Lyndon B. Johnson says, "America's commitment to the exploration of space for peaceful purposes is a firm commitment. We will not retreat from our national purpose. We will not be turned aside in our national effort by those who would attempt to divert us."

"The U.S. space program was undertaken in 1958, and accelerated in 1961, because two Presidents and the Congress considered it basic to our national strength and essential to our continued leadership of the free world," so reports James E. Webb, NASA Administrator.

All educators will agree that teaching children and youth about our earth and its peoples may well be the hub of the wheel of education. Many of these same educators would include in today's school curricula instruction about the ocean of air that envelopes the earth. Teaching an organized program about space, however, is an educational effort still in its infancy. Much credit for this initial and meritorious effort belongs to the NASA office of Public Affairs, Educational Programs Division, located in Washington, D.C., and represented in the several regional research and development centers.

NASA's support for education concerned especially with the challenges of the Space Age has taken several forms. In the opinion of many educators, however, the most imaginative and useful service to date has been the Spacemobile. When the history of the aerospace education movement is written, certainly the Spacemobile project will become an important chapter.

Without doubt, another important chapter in this history of the aerospace education movement will be the television presentations featuring the U.S. satellite program and the live television showings of American astronauts orbiting the earth. This is America's way of taking all the people of this Nation and of many other nations along on their journeys into space. This bold step is the voice of freedom speaking. Never again will education be restricted to a study of the earth environment, important as this will continue to be.

Introducing Children to Space . . . The Lincoln Plan: The instructional plan presented in this handbook is one that has worked successfully in the Lincoln, Nebr., schools, grades K through 6. Activities are presented at maturity levels—5 years through 11 years. Many of the activities shown are suggested as a direct result of their successful use within Lincoln classrooms.

The activities presented are correlated with an aerospace bookshelf composed of books and instructional materials. These materials were carefully evaluated by the Lincoln Public Schools teachers who had used them in their classrooms. These same teachers helped to assign each educational aid to its appropriate maturity level(s). A complete bibliography of instructional materials appears at the end of the handbook.

Divisions of the handbook are based upon maturity level of children—*not* on their chronological age. It is assumed that the teacher, within whose class many levels of maturity are represented, will feel free to use materials from several levels in attempting to meet individual needs of her class.

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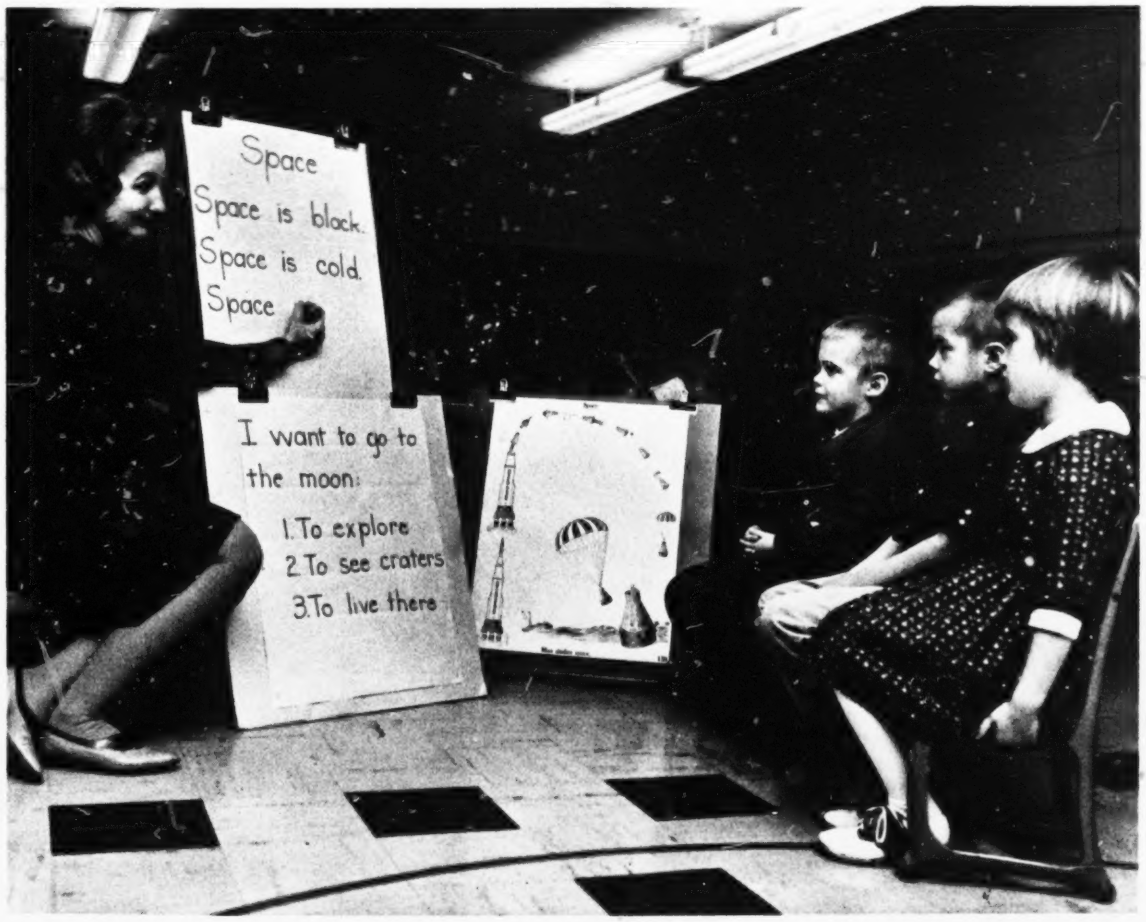
SECTION 1

Maturity Level—Five Years*

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
A Book of Planets for You[T]	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about the planets (see picture 5–1).


Space
Space is black.
Space is cold.
Space
I want to go to the moon:
1. To explore
2. To see craters
3. To live there

5–1.—Writing an experience chart about space.

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* Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

	ART	*Graphic* Have children draw or paint pictures of their ideas of the planets.
	ARITHMETIC	*Number Experience* a. Compare size of planets to size of known objects. b. Using a globe to represent the earth, compare it to the size of other planets.
A Book of Satellites for You T	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about the satellites. *Dramatic Play* Dramatize the launching of a satellite.

An Astronaut I'll Be

5–2.—Drawing pictures of satellites and space ships.

	ART	*Graphic* a. Draw or paint pictures of satellites and space (see picture 5–2). b. Draw or paint pictures illustrating aerospace terms. Make a "pictionary." *Construction* a. Build rockets with blocks. b. Build a rocket base with blocks.
	ARITHMETIC	*Number Experience* a. Compare the size and weight of satellites to size of known objects.

		b. Count down the launching of a satellite. c. Compare the size of a thermometer to the size of a thermistor.
I Want to Be a Space Pilot [T]	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about the air, the moon, and gravity. *Dramatic Play* a. Dramatize the story of a space pilot. b. Dramatize conversation between space pilot and earth.
	ART	*Graphic* a. Draw or paint pictures of a space pilot. b. Draw or paint pictures of a moon station. c. Draw or paint pictures of what a space pilot sees when he looks out of the space ship or when he looks down toward earth from the space ship. *Construction* a. Build a space ship with blocks. b. Build a moon base with blocks.
	MUSIC	*Rhythms* Imitate the feeling of floating weightless in space.
Man on the Moon [T]	LANGUAGE ARTS	*Experience Charts* a. From class dictation write simple chart stories about the moon. b. From class dictation write simple chart stories about a trip to the moon. c. From class dictation write a simple chart story, "Why I Would Like to Go to the Moon." *Dramatic Play* Dramatize a trip to the moon.
	ART	*Graphic* a. Draw or paint pictures of "the man in the moon" or other figures imagined in the moon. b. Draw or paint pictures of a trip to the moon. *Construction* a. Make paper-bag space helmets. b. Build a rocket ship with blocks. c. Build a moon base with blocks.
Rocket Mouse [T]	LANGUAGE ARTS	*Experience Charts* a. From class dictation write simple chart stories about the mouse's adventures. b. From class dictation write simple chart story, "How I Would Feel in Space."

		Dramatic Play Dramatize parts of the adventures of the rocket mouse.
	ART	*Graphic* a. Draw or paint pictures of the rocket mouse at various stages of his adventures. Make a booklet of them. b. Draw or paint pictures illustrating aerospace terms. Make a "pictionary."
The Sun, the Moon, and the Stars ^{T}	LANGUAGE ARTS	*Experience Charts* a. From class dictation write simple chart stories about the solar system. b. From class dictation write simple chart stories about the moon.
	ART	*Graphic* a. Draw or paint pictures of the solar system. b. Draw or paint pictures of the moon.
The True Book of Moon, Sun, and Stars ^{T}	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about the moon, sun, solar system, and stars.
	ART	*Graphic* a. Draw or paint pictures of the moon. b. Draw or paint pictures of what the surface of the moon may be like.
	ARITHMETIC	*Number Experience* Look at a penny when it is near, and, again, when it is across the room. Notice how distance makes it seem smaller.

Category: Pamphlets, Brochures, and Kits

America in Space ^{T}	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about the U.S. space program.
Aviation Activities ^{T}	LANGUAGE ARTS	*Experience Charts* a. From class dictation write simple chart stories about airplanes. b. From class dictation write simple chart stories about a trip on a plane. *Dramatic Play* Dramatize a trip on an airplane.
	ART	*Construction* a. Make a glider or airplane of paper. b. Make pilot or stewardess hats and earphones. c. Build an airplane with blocks. d. Build an airport with blocks.

		Graphic a. Draw or paint pictures of different kinds of clouds. b. Draw or paint pictures illustrating aerospace terms. Make a "pictionary."
	MUSIC	*Rhythms* Imitate the movements of an airplane. Use musical background.
Look to the Sky [T]	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about kinds of airplanes.
	ART	*Graphic* a. Draw or paint pictures illustrating aerospace terms. Make a "pictionary." b. Draw or paint a mural of different kinds of airplanes. *Construction* Build an airplane with blocks.
	MUSIC	*Rhythms* Imitate different kinds of airplanes. Use musical background.
You and Space [T]	LANGUAGE ARTS	*Experience Charts* From class dictation write simple chart stories about space. *Dramatic Play* a. Dramatize a trip in space. b. Make a space suit to fit pupils. Use coveralls, a child's space helmet, gloves, and heavy shoes or boots.
	ARTS	*Graphic* Draw or paint pictures about space. *Construction* Build a space capsule with blocks.

SECTION 2

Maturity Level—Six Years*

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
A Book of Planets for You[P]	LANGUAGE ARTS	*Written* Write chart stories about the planets.
	ART	*Graphic* Draw or paint pictures of the planets.
	ARITHMETIC	*Size* Compare size of planets to size of earth.
A Book of Satellites for You[P]	LANGUAGE ARTS	*Reading* Develop picture dictionary of aerospace vocabulary. *Written* Write chart stories about satellites.
	ART	*Graphic* Draw or paint pictures of satellites and space.
	ARITHMETIC	*Size* Compare size of satellites to size of known objects.
I Want to Be a Space Pilot[P]	LANGUAGE ARTS	*Written* Write chart stories about the air, the moon, and gravity (see picture 6–1). *Drama* Dramatize the story of a space pilot.
	ART	*Graphic* a. Draw or paint pictures of a space pilot. b. Draw or paint pictures of a moon station.
Man on the Moon[T]	LANGUAGE ARTS	*Written* a. Write chart stories about the moon. b. Write chart stories about a trip to the moon. c. Write chart story, "Why I Would Like to Go to the Moon."

---

* Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

Drama

Dramatize a trip to the moon.

ART

Graphic

Draw or paint pictures of "the man in the moon" or other figures imagined in the moon.

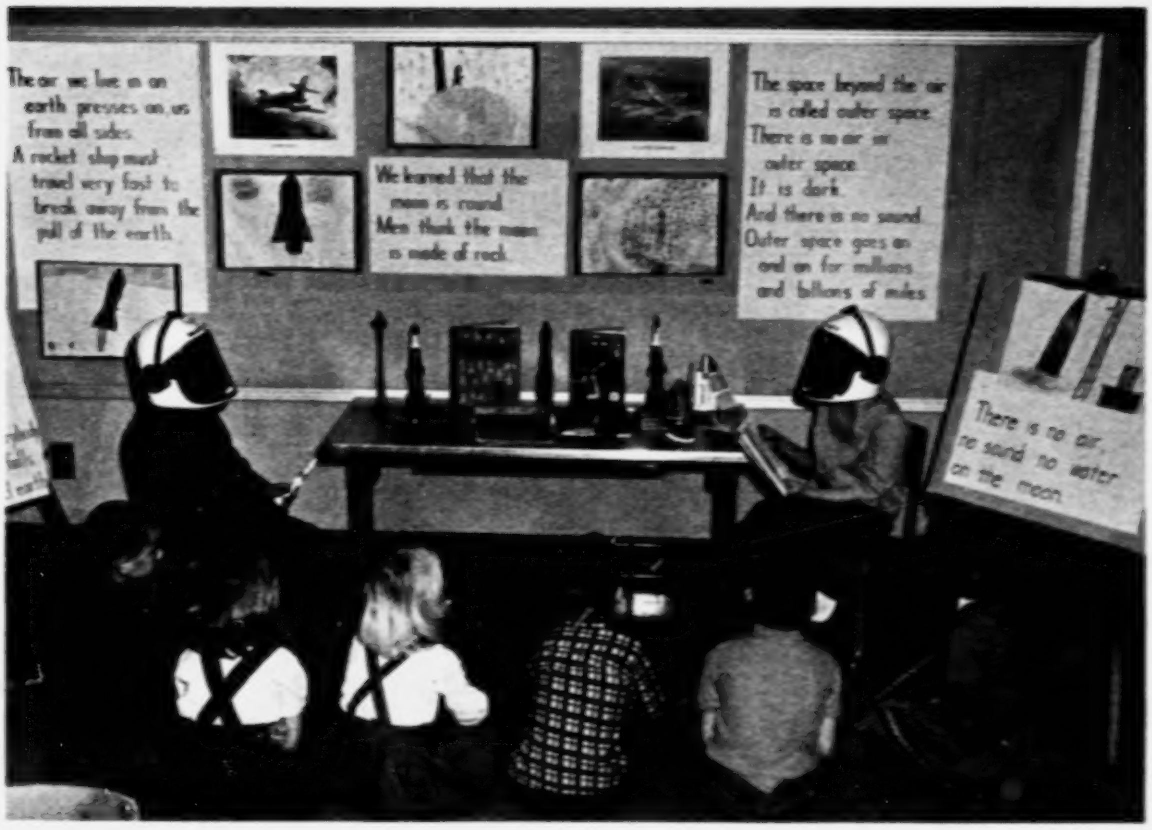
Construction

a. Make paper-bag space helmets.
b. Make oatmeal-box oxygen tanks.
c. Construct a space ship for a moon trip (see picture 6–2).

HEALTH

Food

Prepare a balanced meal with a blender. Put into plastic bags. Eat as an astronaut would by squeezing bag.


The air we live in on earth presses on us from all sides.
A rocket ship must travel very fast to break away from the pull of the earth.
We learned that the moon is round.
Men think the moon is made of rock.
The space beyond the air is called outer space.
There is no air in outer space.
It is dark.
And there is no sound.
Outer space goes on and on for millions and billions of miles.
There is no air, no sound no water on the moon.

6–1.—Listening to a story about a trip to the moon.

Off into Space[T]

LANGUAGE ARTS

Written

Write chart stories of adventures as a space traveler.

Drama

Dramatize the life of a space traveler.

ART

Graphic

Draw or paint pictures of space adventures.

Science

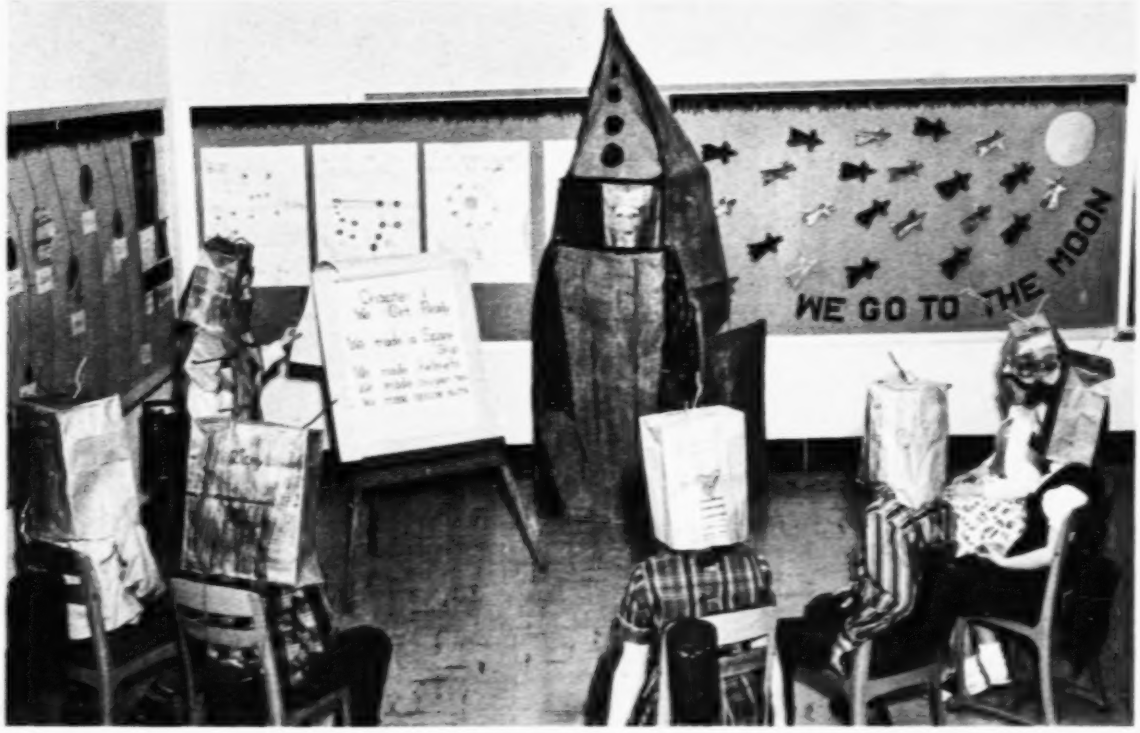
Air

a. Cover with heavy paper a glass tumbler full of water. Turn sidewise and upside down to show that air presses in all directions.

b. Try to drink water through a straw (glass tube) fitted into a one-hole stopper which seals the water container.

Gravity

Stand on head. Try to eat a cracker, and drink milk through a straw while in this position. Notice that gravity is not necessary for swallowing.


WE GO TO THE MOON

6–2.—Taking an imaginary trip to the moon.

Rocket Mouse [T]

Language Arts

Reading

Develop picture dictionary of aerospace terms.

Written

a. Write chart stories about mouse's adventures.

b. Write chart story, "How I Would Feel in Space."

Art

Graphic

Draw or paint pictures of the rocket mouse at various stages of his adventure. Make a booklet of them.

	SCIENCE	*Air* Show that air pressure on a parachute slows the fall of an object. Make a parachute from a piece of cloth. Drop an article without parachute attached, then with parachute attached.
Rockets into Space^{T}	ART	*Graphic* Draw or paint pictures of rockets. *Construction* Make a model three-stage rocket of construction paper (see picture 6–3).

The air we live in on earth presses on us from all sides
A rocket ship must travel very fast to break away from the pull of the earth
We learned that the moon is round
Men think the
is m

6–3.—Making a model of a three-stage rocket.

		Sculpture Make model rockets from clay.
	SCIENCE	*Plants* Grow plants with and without light.
Space Monkey^{T}	LANGUAGE ARTS	*Written* Write chart stories about Miss Baker.

		Drama Dramatize sending Miss Baker into space.
	ART	*Graphic* Draw or paint pictures of Miss Baker's story and make a "movie" of them. *Construction* Make a rocket of cardboard tubes. Make oatmeal-box capsule for monkey, using clay and cotton to fit and pad it. Make clay monkey to fit in capsule.
The Sun, the Moon, and the Stars^{T}	LANGUAGE ARTS	*Written* a. Write chart stories about the solar system. b. Write chart stories about the moon.
	ART	*Graphic* Draw or paint pictures of the solar system.
	SCIENCE	*Gravity* Throw ball into air; discuss why it always comes down. *Day and Night* Shine flashlight on turning ball.
The True Book of Moon, Sun, and Stars^{P}	LANGUAGE ARTS	*Written* Write chart stories about the moon, sun, solar system, and stars.
	ART	*Graphic* a. Draw or paint pictures of the moon in its phases. b. Draw or paint pictures of what the surface of the moon may be like.
	ARITHMETIC	*Size* Look at a penny when it is near, and again, when it is across the room. Notice how distance makes it seem smaller.
	SCIENCE	*Moon* a. Demonstrate that moon reflects sun's light. Hold a mirror in sunlight and show how light may be reflected onto a globe. b. Demonstrate moon phases. Have a child (earth) hold a ball (moon) extended at arms length in front as he rotates to simulate the revolution of the moon about the earth. Have a light bulb (sun) shining on the revolving ball. Child observes that he can see different portions of the lighted surface of the "moon" as he turns.
What Does an Astronaut Do?^{T}	LANGUAGE ARTS	*Written* Write chart stories of space travel. *Drama* Dramatize a trip into space.

MATURITY LEVEL—SIX YEARS

	ART	*Graphic* Draw or paint pictures of space vehicles.
	SOCIAL STUDIES	*Current Events* Have children bring, for discussion, pictures of news about the astronauts.

Category: Pamphlets, Brochures, and Kits

America in Space^{T}	LANGUAGE ARTS	*Written* Write chart stories of the U.S. space program using pictures.
America's Space Pilots^{T}	LANGUAGE ARTS	*Written* a. Write chart stories about the lives of the astronauts. b. Write chart stories about the training of the astronauts.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures about astronauts.
Aviation Activities^{T}	LANGUAGE ARTS	*Reading* Make picture dictionary of aerospace terms. *Written* Write chart stories using picture dictionary. *Drama* Dramatize a trip on an airplane.
	ARITHMETIC	*Number Reading* Read thermometer and keep daily record of temperature.
	ART	*Construction* a. Make a glider or airplane of paper. b. Make pilot or stewardess hats and earphones.
Aviation Units for the Primary Grades^{T}	ART	*Graphic* Make a picture book of kinds of airplanes. *Construction* a. Make paper gliders and airplanes. b. Make silhouettes of common kinds of airplanes. Use as flashcards for children to identify. c. Have an exhibit of model planes. d. From sturdy boxes, make an airplane large enough for children to get into. e. Construct a table-model airport.
	MUSIC	*Music and Rhythms* Dramatize movements of an airplane to music.

	Science	*Air* a. Hold a piece of paper just below lower lip. Blow across the top and notice that the paper rises. b. Crumple one of two pieces of paper that are the same size. Drop them from above the head and notice that crumpled piece offers less air resistance. c. Make parachute of large handkerchief. Tie object to it. Observe how air slows fall of object. d. Make kites and fly them. *Weather* Keep daily weather chart with comments about "good" flying weather. *Action and Reaction* Fasten inflated balloon to small lightweight toy so that when air is released toy will move forward.
Demonstration Aids for Aviation Education[T]	Science	*Weather* Chart the weather for a month using symbols to represent type of day.
Earth and Space Guide for Elementary Teachers[T]	Science	*Sun* Heat a wire until it glows to show that sun's heat is produced by glowing gases. *Plants* Test temperature range of plant growth. Place plants in oven (150–200 degrees), and in refrigerator freezing compartment.
Look to the Sky[P]	Language Arts	*Reading* Develop picture dictionary of aerospace terms. *Written* Write chart stories about kinds of airplanes and how an airplane flies.
	Art	*Graphic* Draw or paint a mural of different kinds of airplanes. *Construction* Make a helicopter large enough for children to get into and "fly." Use chicken wire, cardboard cartons, plastic for windows, and paper (see picture 6–4).
Mike and Nancy Learn About Jets[T]	Language Arts	*Written* Write a chart story about a visit similar to Mike and Nancy's. *Drama* Dramatize a visit similar to Mike and Nancy's.

Weather[T]

SCIENCE

Air

Put a balloon over the mouth of a bottle. Heat bottle to show that air expands when heated.

Weather

a. Keep daily record of weather using symbols.

b. Make a barometer. Bend glass tube in a U-shape with one short side. Put the short side of the "U" into a one-hole stopper. Suspend bottle, fitted with stopper and half-filled with water, upside down. Notice changes in level of water as air pressure varies.

c. Make an anemometer. Fit two pieces of wood together as a cross. Secure a paper cup to each of the four ends. Mount to swing freely on stand.

Our Helicopter
We read about air.
Airplanes go in the air.
We wanted to go up.
We made a helicopter.
We used chicken wire, cardboard boxes, tubes and paper.
We painted the number on it.
P is for Pershing
112 is our room number

6-4.—Learning about helicopters through dramatic play.

You and Space[P]

SCIENCE

Gravity

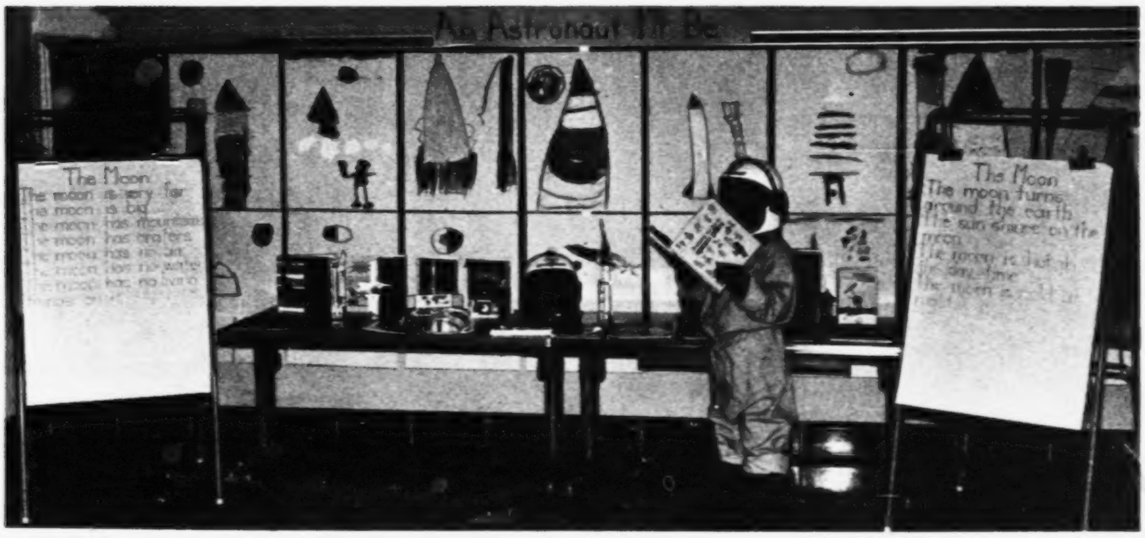
a. Drop pencil, rock, and ball; discuss why they come down.

b. Jump rope. Discuss why rope can be "turned."

ART

Construction

Make a space suit to fit pupils. Use coveralls, a child's space helmet, gloves, and heavy shoes or boots (see picture 6–5).

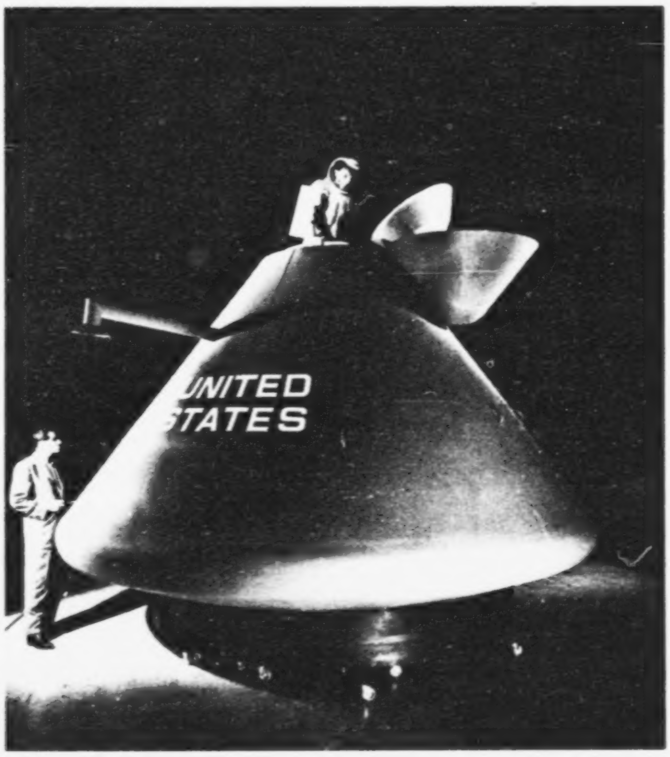

An Astronaut I'll Be
The Moon
The Moon

6–5.—Wearing a space suit increases realism of dramatic play.

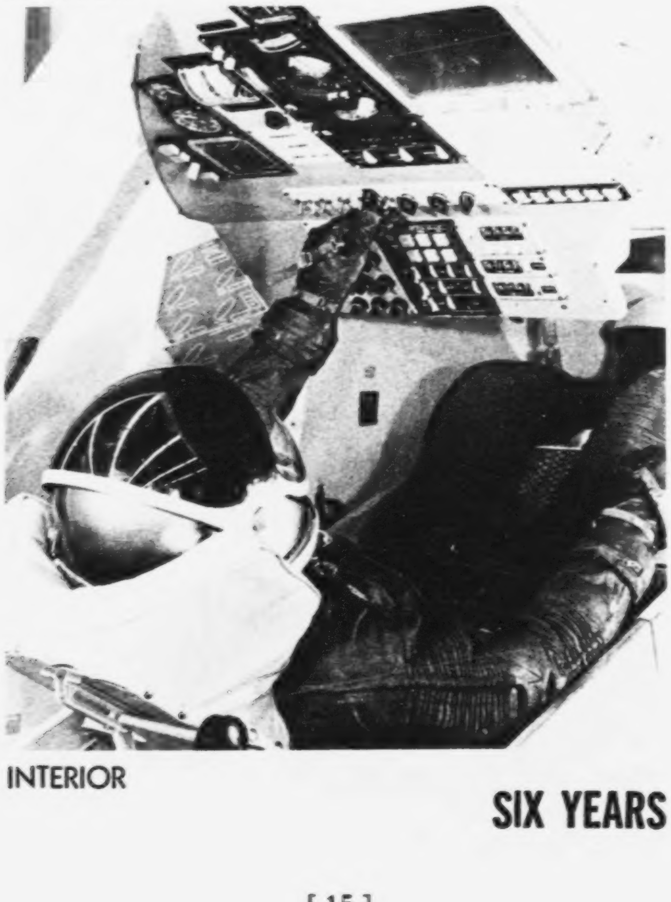
Category: Models

Apollo Command Module: Picture, Drawings, Directions

APOLLO


UNITED
STATES

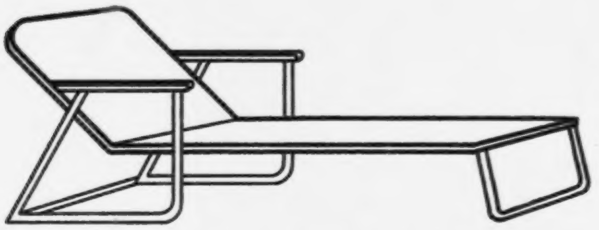
EXTERIOR



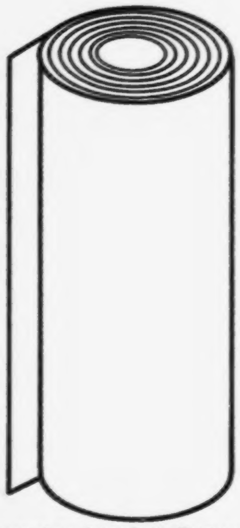
INTERIOR

SIX YEARS

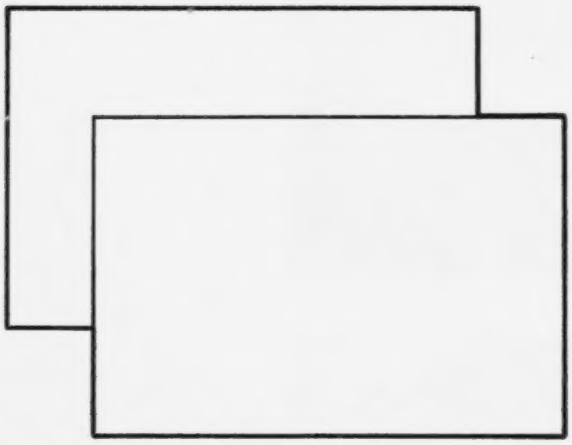
THE MATERIALS



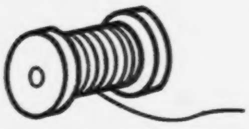
CHILD'S LOUNGE CHAIR



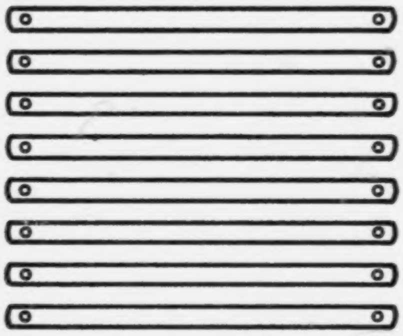
BROWN WRAPPING PAPER 36" OR 42" WIDE



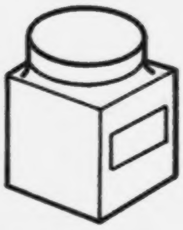
2-TAG BOARD 24" x 36"



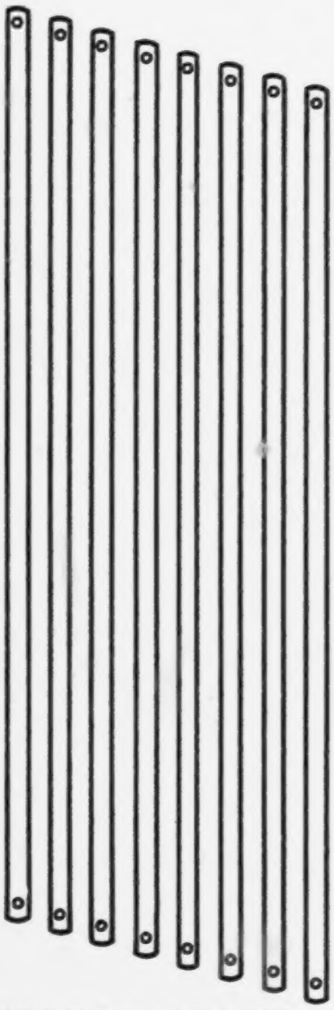
BELL WIRE



8-WOODEN POLES 2 FEET LONG



PASTE



8-WOODEN POLES 6 FEET LONG

Construction

The basic framework for the Apollo is constructed much like an Indian wigwam. Place the child's lounge chair in the space that will be used. The 16 wooden poles (eight, 6 feet long and eight, 2 feet long) should have a ¼-inch hole drilled through each end about 1 inch from the end of the pole.

Pass a piece of bell wire through each of the eight longer poles and bind these loosely together at one end. Place this bound end up and spread the poles wigwam fashion over the child's lounge chair. See figure 6–a.

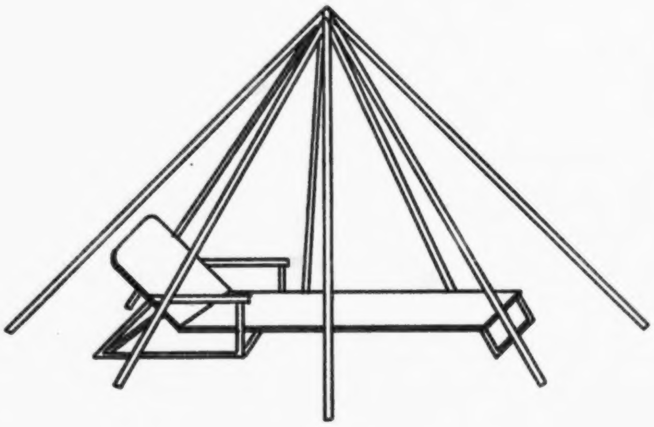


Fig.—6–a.

Place a 2-foot pole between the feet of two of the 6-foot poles and bind tightly with wire. See figure 6–b.

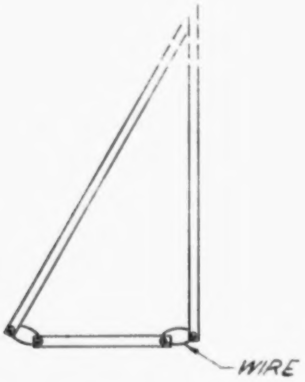


Fig.—6–b.

Continue around the base until all the openings have been filled and the framework is secure. It may be necessary to tighten the wire that holds the peak of the framework together.

Begin covering the framework with brown wrapping paper as shown. See figure 6–c.

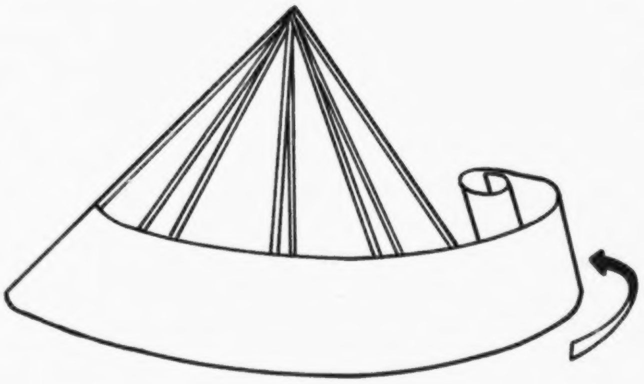


Fig.—6–c.

Place another wrapping above the lower wrapping. Be sure there is enough overlap to make a secure seam when pasted together. See figure 6–d. A third wrapping at the top should completely cover the capsule.

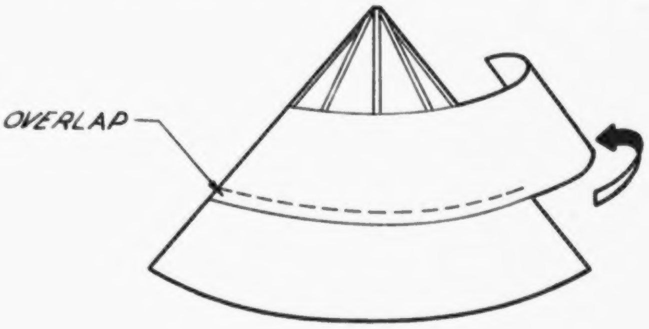


Fig.—6–d.

Cut an entrance to the capsule between two of the upright poles. A door may be made from tagboard and hinged with a loose circle of wire. The weight of the board will hold it closed so no latch is necessary. Windows should cut out in the opposite side (see photograph).

An instrument console should be constructed on the other piece of tagboard. The photograph shows an actual console and should provide an idea regarding layout. Buttons, knobs, and pencil erasers are useful to produce a realistic looking panel. When it is completed, paste it inside facing the astronaut's chair.

Paint the exterior of the capsule with white tempera paint.

Many schools have either portable public address systems, or phonographs or tape recorders that have a public address capacity. Using one of these, a microphone can be placed in the capsule and the 6-year-old astronaut can broadcast back from space, describing his trip for his classmates.

SECTION 3

Maturity Level—Seven Years[*]

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
Balloons Fly High [T]	Language Arts	*Written* Write chart stories of the history of ballooning. *Oral* Make reports on history of ballooning. *Drama* Dramatize episodes in the development of balloon travel.
	Art	*Graphic* Draw or paint pictures illustrating the history of ballooning.
	Science	*Air* a. Demonstrate how an object can rise in air. Float a cork on water. Press it down to the bottom of the container. Release. Discuss why it rises. b. Demonstrate that hot air rises. In a darkened room hold lighted candle in beam of light. Notice, in the shadow, the lines indicating the rising air. c. Demonstrate that air is needed for combustion. Burn lighted candle under a jar. d. Demonstrate how a parachute works. Suspend an object from the four corners of a handkerchief and drop.
A Book of Planets for You [P]	Language Arts	*Written* Write chart stories about the planets. *Oral* Give reports about the planets.
	Arithmetic	*Number Reading* Make chart of planetary sizes and distances from the sun.

[*] Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

		Measurement Compare earth's distance from the sun to the distances of the other planets.
	Science	*Rotation and Revolution* Using children to represent the sun and planets, demonstrate the difference between rotation and revolution. Have them "rotate" as they "revolve" around a "sun."
A Book of Satellites for You ^{P}	Language Arts	*Reading* Develop picture dictionary of aerospace vocabulary. *Written* Write chart stories about satellites.
	Art	*Graphic* Draw or paint pictures of satellites.
	Arithmetic	*Size* a. Compare weight of satellites to child's weight. b. Compare size of satellites to size of known objects. *Measurement* Compare speed of satellites to speed of car, airplane, etc. *Number Reading* Make chart of size, speed, and weight of satellites.
	Social Studies	*Current Events* Have children bring in, for discussion, news pictures and stories about satellites.
Countdown: The Story of Cape Canaveral ^{T}	Language Arts	*Written* Write stories describing the launching of rockets from the Cape. *Drama* Dramatize the launching of a rocket, including "countdown" (see picture 7–1).
	Arithmetic	*Counting* Practice counting "down" with clock.
	Social Studies	*Current Events* Have children bring in, for discussion, news pictures and stories about Cape Kennedy (formerly called Cape Canaveral.)
The First Book of Space Travel ^{T}	Language Arts	*Written* Write chart stories about space travel. *Drama* Dramatize a trip into space. *Oral* Have each child make a tape recording of how he feels while on a trip in space.

ART

Graphic

Draw or paint pictures of space travel or of what might be seen in space.

SCIENCE

Air

Demonstrate need for oxygen for combustion by attempting to burn material in a sealed container.

7-1.—Watching the clock during a rocket-launching countdown.

Plants

a. Grow plants with and without soil.

b. Grow plants with and without light.

c. Compare growth of plants tilted at various angles and hanging upside down.

d. Grow plant in an enclosure filled with carbon dioxide.

Let's Go to a Rocket Base T

LANGUAGE ARTS

Reading

Develop a picture dictionary of aerospace vocabulary.

Written

Write chart stories of a trip to a rocket base.

	ART	*Graphic* Draw or paint pictures of rockets. *Construction* Build table-model rocket base.
Man on the Moon [T]	LANGUAGE ARTS	*Written* Write chart stories about a trip to the moon. *Drama* Dramatize a trip to the moon.
	ART	*Graphic* a. Draw or paint pictures of "the man in the moon" or other figures imagined in the moon. b. Draw or paint "moonscapes." *Sculpture* Make imaginary "moonscapes" using clay.
	HEALTH	*Food* Prepare a balanced meal with blender. Put into plastic bags. Eat as astronaut would eat by squeezing bag.
	SCIENCE	*Sound* Suspend small bell inside a bottle fitted with one-hole stopper containing a glass tube and short piece of rubber tubing which can be clamped closed. Boil small amount of water in bottle long enough to force out all air. Close clamp. Listen for sound of bell in partial vacuum formed when bottle has cooled. *Astronomy* Visit a local observatory to see the moon.
	SOCIAL STUDIES	*Current Events* Have children bring in, for discussion, news pictures and stories about our moon project.
Off into Space [T]	LANGUAGE ARTS	*Written* Write story of adventures as a space traveler. *Drama* Dramatize the life of a space traveler.
	ART	*Graphic* a. Draw or paint pictures of space adventures. b. Make "gravity" pictures with string dipped in tempera paint. Place paper on floor; allow string to fall where gravity will.

Construction

a. Make paper-bag space helmet.

b. Make oatmeal-box oxygen tanks.

c. Build a table model of a space station.

SCIENCE

Air

a. Cover glass tumbler full of water with heavy paper. Turn sidewise and upside down to show that air presses in all directions.

b. Try to drink water through a straw (glass tube) fitted into a one-hole stopper which seals the water container air tight.

Gravity

Stand on head. Try to eat a cracker and drink milk through a straw while in this position. Note that gravity is not necessary for swallowing.

Action and Reaction

Inflate balloon. Notice air presses in all directions. When balloon is released, air no longer presses in direction of air flow, but continues to press in all other directions and balloon goes in direction opposite to escaping air.

Plants

a. Grow radish seeds on a wet blotter between two pieces of glass placed upright in a container. After five days note direction of growth of roots and stems, and turn the glass upside down. Watch direction of growth of roots and stems.

b. Plant a terrarium in a jar that can be sealed. Start with a layer of charcoal, then a layer of soil. Water sufficiently after planting and seal. Place in a sunny location. Notice how water drops collect and return to the soil.

Project Mercury [T]

LANGUAGE ARTS

Written

Write chart stories of the Project Mercury flights.

Drama

Dramatize the launching and flight sequences of the Mercury capsules.

ART

Construction

Construct a large-scale Mercury capsule using chicken wire for framework. Cover with aluminum foil. If possible make it large enough for a child to get into.

Rocket Mouse [T]	LANGUAGE ARTS	*Written* a. Write chart stories about mouse's adventures. b. Write chart story, "How I Would Feel in Space." *Reading* Develop picture dictionary of aerospace terms.
	ART	*Graphic* Draw pictures of the rocket mouse at various stages of his adventure. Make "movie" of them.
	SCIENCE	*Air* Show that air pressure on a parachute slows fall of an object. Make a parachute from a piece of cloth. Drop an article without parachute attached, then with parachute attached.
Rockets into Space [T]	LANGUAGE ARTS	*Written* Write chart stories about building a space station and about living on the moon. *Drama* Dramatize a day on a space station.
	ART	*Construction* Build a model rocket or space station.
	SCIENCE	*Plants* a. Grow plants with and without soil. b. Grow plants with and without light. c. Compare growth of plants tilted at various angles and hanging upside down. d. Grow plant in an enclosure filled with carbon dioxide.
Space Book for Young People [T]	ARITHMETIC	*Measurements* a. Make a table of weight comparisons on different planets (see picture 7–2). b. Make a chart showing comparative sizes and distances of planets.
	ART	*Graphic* Make a mural of our galaxy in space, showing approximate location of our solar system.
	SCIENCE	*Action and Reaction* Demonstrate reaction by having child stand in small wagon and jump out, causing wagon to move in opposite direction.
Space Monkey [T]	LANGUAGE ARTS	*Written* Write chart stories about Miss Baker's flight.

Drama

Dramatize sending an animal into space (see picture 7–3).

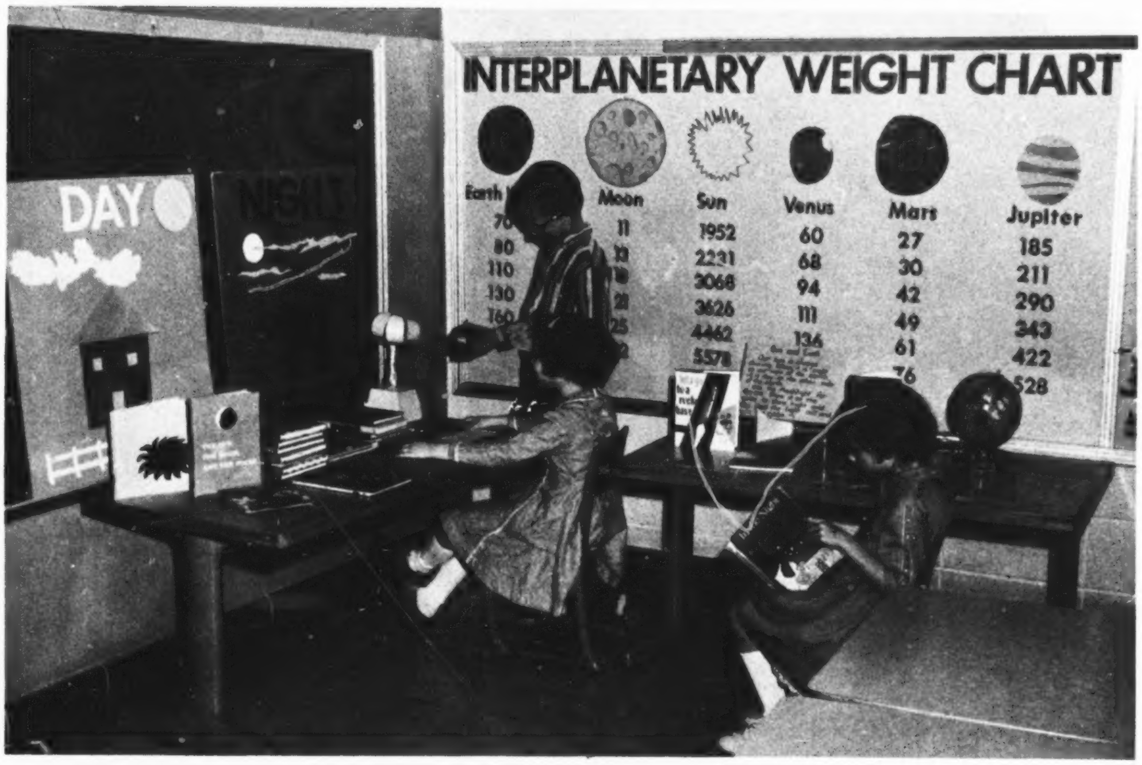
ART

Graphic

Draw or paint pictures of Miss Baker's story and make booklet of them.

Construction

Construct a rocket of cardboard tubes. Make an oatmeal-box capsule for monkey using clay and cotton to fit and pad it. Make clay monkey to fit in capsule.


INTERPLANETARY WEIGHT CHART
DAY
NIGHT
Earth
80
110
130
Moon
11
Sun
1952
2231
3068
3626
4462
5578
Venus
60
68
94
111
136
Mars
27
30
42
49
61
Jupiter
185
211
290
343
422

7–2.—Making a comparison of weights on different planets.

SCIENCE

Air

a. Place end of a length of glass tubing into water. Cover other end with finger; raise out of water. Notice that air pressure keeps water suspended in tube.

b. Prick inflated balloon with a pin to demonstrate that air under great pressure will escape into area of less pressure.

c. Place sheet of asbestos on some source of heat. Notice that side next to heat becomes quite hot, but side away from heat

		does not. Compare earth's atmosphere, blanketing the earth from the sun's heat, to asbestos sheet.
The Sun, the Moon, and the Stars[T]	LANGUAGE ARTS	*Written* Write chart stories about the members of the solar system.
	ART	*Graphic* Draw or paint pictures of the members of the solar system.

Our Trip to the Moon
USA
No gravity
USS
brown
red

7–3.—Sending a rabbit on an imaginary trip to the moon.

	SCIENCE	*Gravity* Throw ball into air; discuss why it always comes down. *Night and Day* Shine flashlight on turning ball. *Rotation and Revolution* a. Demonstrate, using ball, knitting needles, and orange. b. Have pupils observe and report changes in position of stars at different times on the same night. *Sun* Show the difference between glowing heat and heat from material being con-

		sumed, by comparing heat from light bulb to heat from burning paper or wood.
Telstar [T]	LANGUAGE ARTS	*Written* Write chart stories about communicating by satellite. *Drama* Dramatize the launching of Telstar.
	ART	*Graphic* Draw or paint pictures of Telstar in orbit.
What Does an Astronaut Do? [T]	LANGUAGE ARTS	*Written* Write chart stories about the work of an astronaut. *Drama* Dramatize a trip into space.
	ART	*Graphic* Draw or paint pictures of space vehicles. *Construction* Build a table-model moon base.
	SOCIAL STUDIES	*Current Events* Have children bring in, for discussion, news pictures and stories about our astronauts.
	HEALTH	*General* Check health of class to see if they would be eligible to be astronauts. For example: take height, weight measurements. Count pulse before and after exercise.

Category: Pamphlets, Brochures, and Kits

America in Space [P]	LANGUAGE ARTS	*Written* Write chart stories of U.S. space program using pictures.
America's Space Pilots [T]	LANGUAGE ARTS	*Written* a. Write chart stories about the lives of the astronauts. b. Write chart stories about the training of the astronauts.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures about astronauts.
Aviation Activities [T]	LANGUAGE ARTS	*Reading* Make picture dictionary of aerospace terms. *Written* Write chart stories using picture dictionary. *Drama* Dramatize a trip on an airplane.

	ARITHMETIC	*Number Reading* Read thermometer and keep daily record of temperature.
	SCIENCE	*Airplane* Make a glider or airplane of paper. *Air* Make pinwheels. *Weather* Make thermometer. Put colored water in bottle fitted with one-hole stopper containing a length of glass tubing. Note how changes in temperature cause water in tube to rise and fall.
	ART	*Construction* Make pilot or stewardess hats and earphones.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot, stewardess, or other airline worker to visit class.
Aviation Units for the Primary Grades[T]	LANGUAGE ARTS	*Written* Write about an imaginary airplane trip. *Drama* Dramatize an imaginary airplane trip.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot, stewardess, or other airline worker to visit class.
	MUSIC	*Music and Ryhthms* a. Dramatize movements of airplane to music. b. Make up hand plays about airplane movements.
	SCIENCE	*Air* a. Hold a piece of paper just below lower lip. Blow across the top and notice that the paper rises. b. Crumple one of two pieces of paper that are the same size. Drop from above the head and notice that crumpled piece offers less air resistance. c. Make parachute of large handkerchief. Tie object to it. Observe how air slows fall of object. d. Make kites and fly them. *Weather* Keep daily weather chart with comments about "good" flying weather.

		Action and Reaction Fasten inflated balloon to small lightweight toy so that when air is released toy will move forward.
	ART	*Graphic* a. Make a picture book of kinds of airplanes. b. Make silhouettes of common kinds of airplanes. Use as flashcards for children to identify. *Construction* a. Make paper gliders and airplanes. b. Have an exhibit of model planes. c. From sturdy boxes, make an airplane large enough for children to get into. d. Construct a table-model airport. e. Construct dioramas of an airport. f. Make pilot or stewardess hats and radio earphones. g. Make mobiles of airplanes.
Demonstration Aids for Aviation[T]	SCIENCE	*Weather* a. Chart the weather for a month using symbols to represent type of day. b. Demonstrate condensation. Place a glass of warm water beside a glass of water containing ice cubes. Discuss the source of the water droplets that form. *Air* a. Show that air takes up room by attempting to fill quickly a bottle equipped with one-hole stopper fitted with a funnel. Insert straw to allow air to leave bottle and notice how water will then go into bottle. b. Show that air has weight. Balance inflated balloons on a stick suspended by a string. Break one balloon to let air escape. Notice balloon filled with air is heavier than empty balloon. c. Show air pressure. Place end of medicine dropper in pan of water. Squeeze and notice air leaving. Release and notice water replaces lost air. Hold in the air and notice that air pressure keeps water in the tube. d. Demonstrate that air moves. Burn a string in a dish and notice direction smoke travels. e. Demonstrate that air expands. Heat a lightly stoppered, empty test tube until air forces stopper out.

		f. Show convection currents. Hold smoking punk over source of heat, then over cold surfaces. *Airplane* Demonstrate use of propellers. Move small wagon by means of a fan set in it.
Earth and Space Guide for Elementary Teachers ^{T}	SCIENCE	*Sun* Heat a wire until it glows to show that sun's heat is produced by glowing gases. *Plants* Test temperature range of plant growth. Place plants in oven (150–200 degrees), and in refrigerator freezing compartment. *Day and Night* Shine a light on a turning globe in a darkened room. *Light* Shine a beam of light in a darkened room. Notice dust particles. Increase amount of particles by adding chalk dust from an eraser. Notice increased brightness as light is reflected from greater number of particles. Note that space is dark because there are no dust particles.
How to Forecast the Weather ^{T}	ART	*Graphic* Draw pictures of different kinds of clouds.
	SCIENCE	*Weather* Keep a daily record of cloud types.
Look to the Sky ^{P}	LANGUAGE ARTS	*Reading* Develop picture dictionary of aerospace terms. *Written* Write chart stories about kinds of airplanes, airplane workers, and how an airplane flies. *Drama* Dramatize a day in the life of a pilot, stewardess, or other aircraft worker.
	ART	*Construction* Make an airplane of cardboard cartons large enough for the children to "fly."
Mike and Nancy Learn About Jets ^{T}	LANGUAGE ARTS	*Drama* Dramatize a visit like Mike and Nancy's. *Written* Write about a visit to an airport.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot or stewardess to talk to the class.

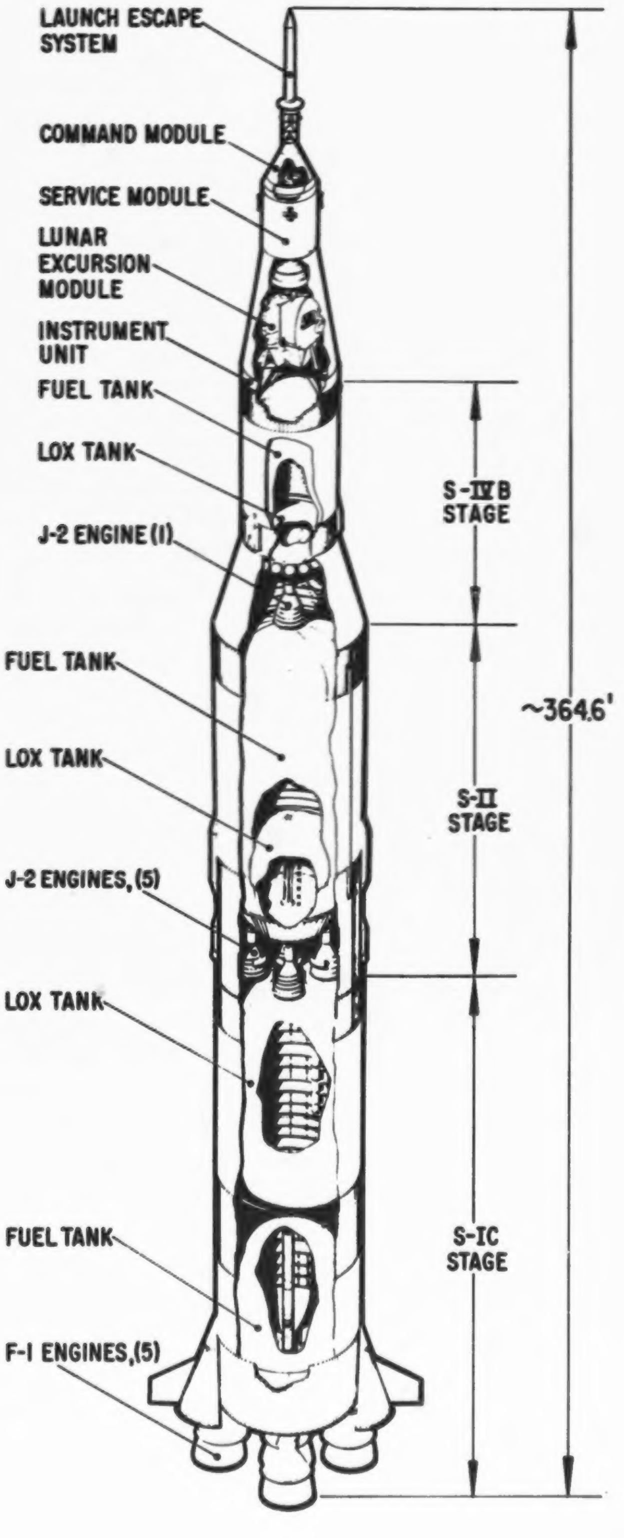
Maturity Level—Seven Years

Tilly the Tiger [T]	Language Arts	*Written* a. Write a chart story about Tilly's trip. b. Write a chart story about an airplane trip. *Drama* Dramatize Tilly's trip, using puppets.
	Art	*Construction* Make puppets of animal characters.
Weather [T]	Science	*Air* Put a balloon over the mouth of a bottle. Heat bottle to show that air expands when heated. *Weather* a. Keep daily record of weather using symbols to represent kind of day. b. Make a barometer. Bend glass tube in a U-shape with one short side. Put the short side of the "U" into one-hole stopper. Suspend bottle, fitted with stopper and half-filled with water, upside down. Notice changes in level of water as pressure varies. c. Make an anemometer. Fit two pieces of wood together in a cross. Secure four paper cups to ends. Mount to swing freely on stand.
You and Space [P]	Language Arts	*Drama* Dramatize sending "astronaut" into orbit.
	Science	*Gravity* a. Have child jump into the air. Discuss why he comes down again. Discuss what would happen without gravity. b. Swing ball on the end of a string around the head to show that pull of gravity (string) keeps ball in "orbit." c. Drop pencil, rock, and ball; discuss why they come down. d. Jump rope. Discuss why rope can be "turned."
	Art	*Construction* Make a space suit to fit pupils. Use coveralls, a child's space helmet, gloves, and heavy shoes or boots.

Category: Models

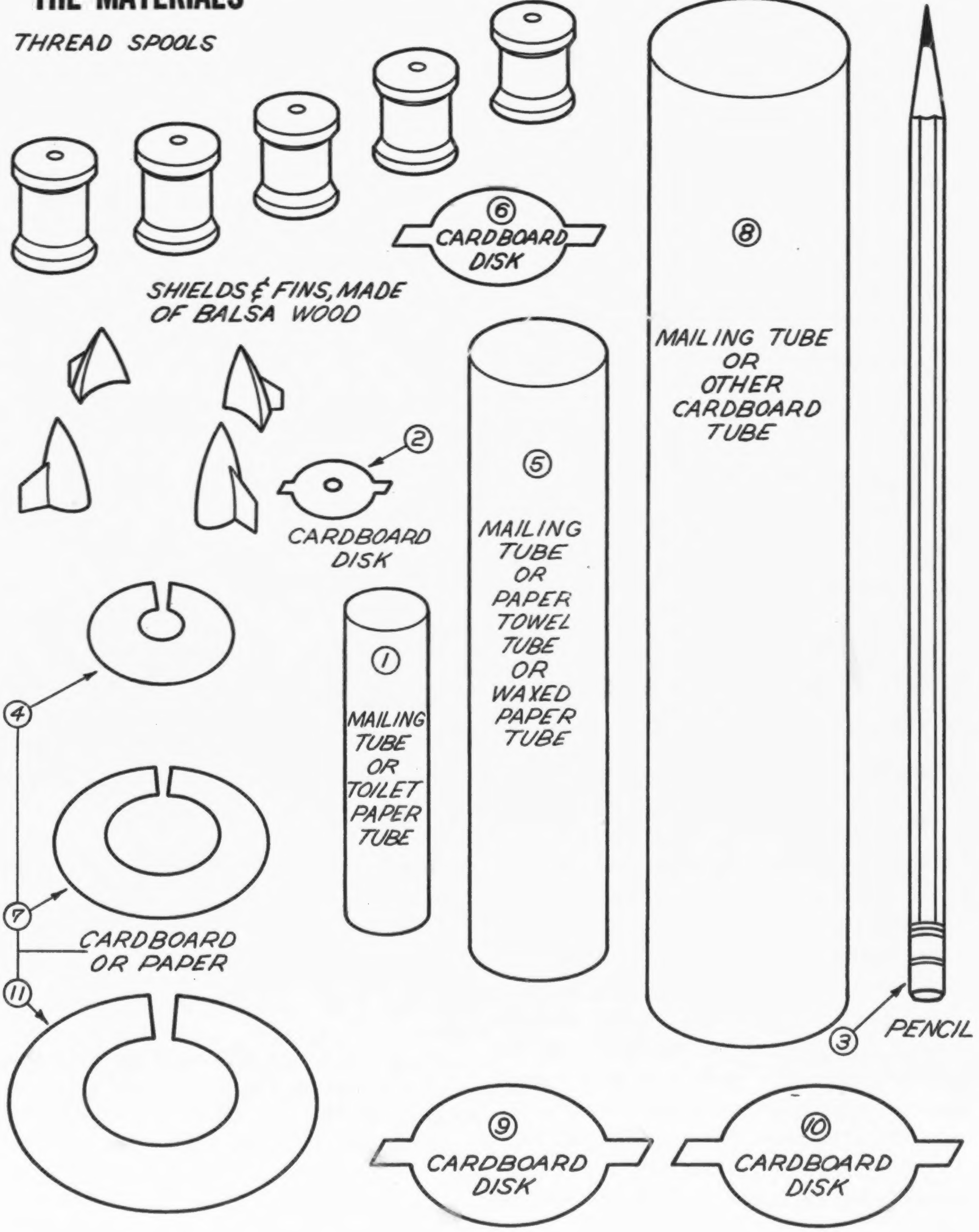
Saturn Rocket: Picture, Drawings, Directions

SATURN


LAUNCH ESCAPE SYSTEM
COMMAND MODULE
SERVICE MODULE
LUNAR EXCURSION MODULE
INSTRUMENT UNIT
FUEL TANK
LOX TANK
J-2 ENGINE (1)
FUEL TANK
LOX TANK
J-2 ENGINES, (5)
LOX TANK
FUEL TANK
F-1 ENGINES, (5)
S-IVB STAGE
~364.6'
S-II STAGE
S-IC STAGE

SEVEN YEARS

THE MATERIALS


THREAD SPOOLS
⑥ CARDBOARD DISK
⑧
SHIELDS & FINS, MADE OF BALSA WOOD
MAILING TUBE OR OTHER CARDBOARD TUBE
②
⑤
CARDBOARD DISK
MAILING TUBE OR PAPER TOWEL TUBE OR WAXED PAPER TUBE
①
④
MAILING TUBE OR TOILET PAPER TUBE
⑦
CARDBOARD OR PAPER
⑪
③ PENCIL
⑨ CARDBOARD DISK
⑩ CARDBOARD DISK

Construction

The Saturn V rocket and Apollo capsule model is made with three cardboard tubes, a pencil, five empty thread spools, four balsawood blocks, and seven cardboard disks and connecting collars. The basic model will vary in size, depending on the cardboard tubes that are available. The cardboard tubes may come from a variety of sources and in differing sizes. The most readily available source of suitable cardboard tubes is a local stationery or book store. Pupils can, however, provide a number of usable tubes.

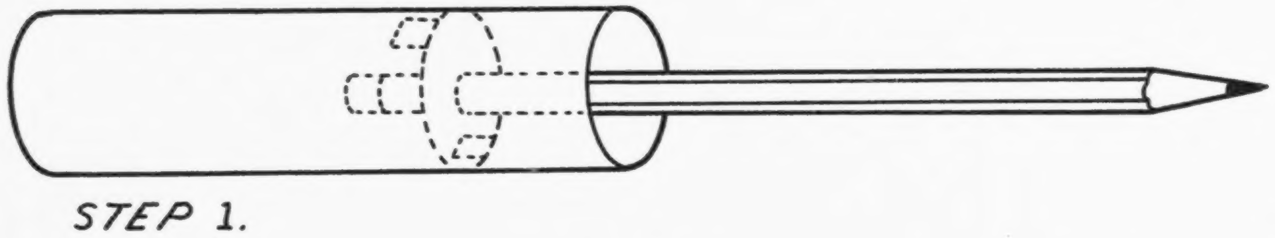


Fig.—7–a.

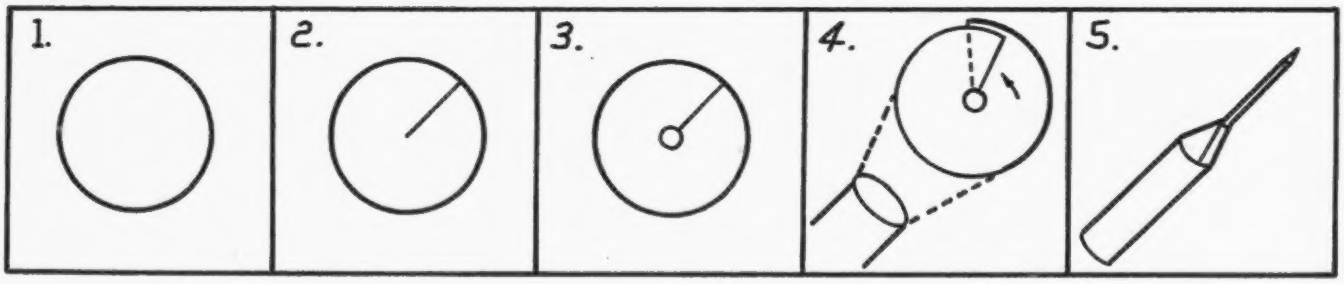


Fig.—7–b.

The model shown here begins with a cardboard tube 4 inches long taken from a roll of tiolet paper. All specifications are given in round numbers so that different-size models may be made, using simple arithmetic to convert from the scale given with this model to the scale of the materials that a teacher may have available. For smaller children, it is recommended that the largest available materials be used.

Step 1.—Apollo Capsule

Place cardboard tube (1) on sheet of cardboard and trace around the diameter of the tube to make disk (2). Draw glue flaps on each side of disk (2); then cut disk and flaps from sheet. Punch a pencil-size hole through the center of the disk. Fold flaps down, apply glue, and place in tube (1) about one-fourth of the way from the top of the tube. Insert pencil (3) in the hole so that it protrudes about the length of the tube. See figure 7–a.

The paper collar (4) is made from construction paper as shown in figure 7–b:

1. Cut a circle 5 inches in diameter.
2. Cut a slit from the edge to the center point.
3. Cut out a pencil-size hole in the center.
4. Slide one edge of the cut line under the other until the collar fits the top of the tube.
5. Glue the collar in place.

Step 2.—Saturn V, Third Stage

The cardboard tube (5) for Step 2 was from a roll of waxed paper. A cardboard disk (6) is made as in Step 1. It is glued about ½ inch below the top in tube (5). The Apollo capsule is glued on top of disk (6). A paper collar (7) is made as in Step 1, except that a paper circle 6 inches in diameter is used and a hole the diameter of tube (1) is cut in the center. See figure 7–c.

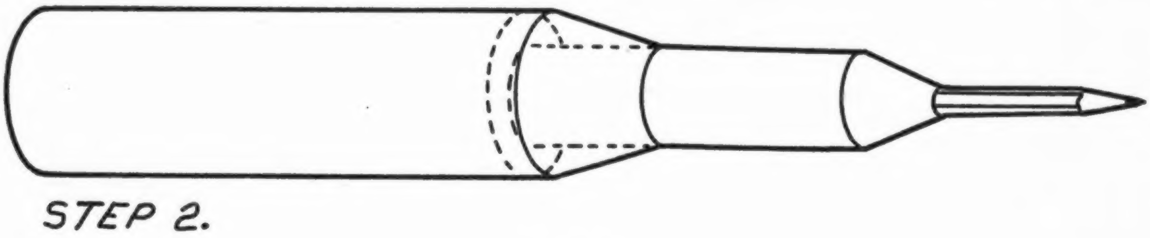


Fig.—7–c.

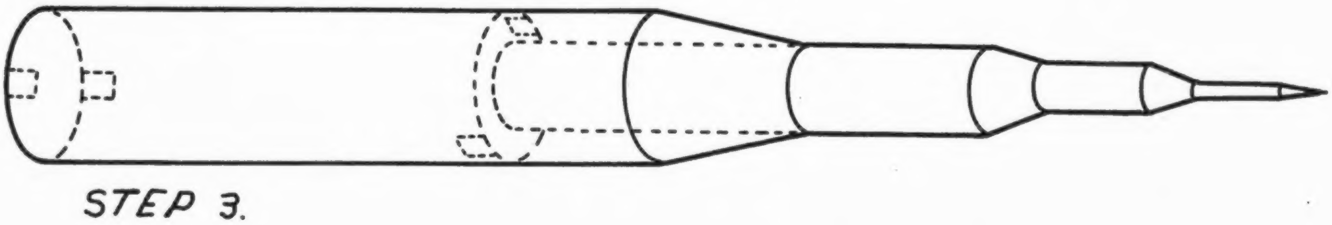


Fig.—7–d.

Step 3.—Saturn V, First and Second Stages

Tube (8) is a mailing tube 16 inches long. Cardboard disks (9) and (10) are cut to fit within it. Disk (9) is placed so that about 6 inches of tube (5) protrudes from tube (8). Disk (10) is glued even with the bottom of tube (8). Paper collar (11) is formed from a circle 7 inches in diameter. See figure 7–d.

Step 4.—Engine, Engine Shields, and Stabilizing Fins

Engines are made from five empty thread spools. One spool is glued in the center of disk (10). The other four are glued on the edge of disk (10), spaced equally around the circumference.

Engine shields are cut from balsa wood or white pine. Cut two cones approximately 2 inches high and 2 inches in diameter. Split each cone through the center to make two engine shields. See figure 7–e. Glue the shields to tube (8) just above each of the four outside engines. Four stabilizer fins may be made from two pieces of thin balsa wood, 1 inch by 1½ inches, as shown in figure 7–f. Glue fins on engine shields. See figure 7–g.

Step 5.—Finish

1. Paint five engines black.
2. Paint everything else white.
3. Trim may be added as shown in photograph.

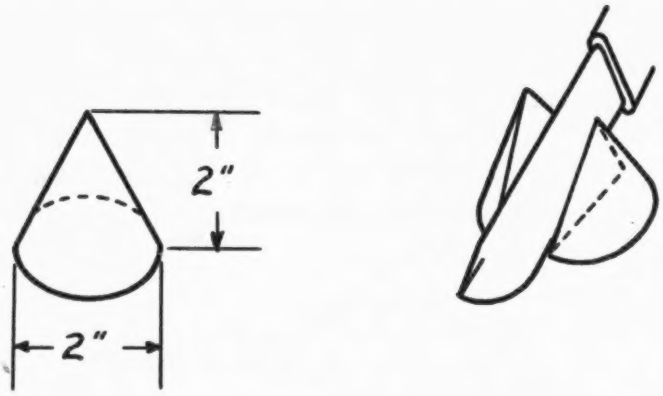


Fig.—7–e.

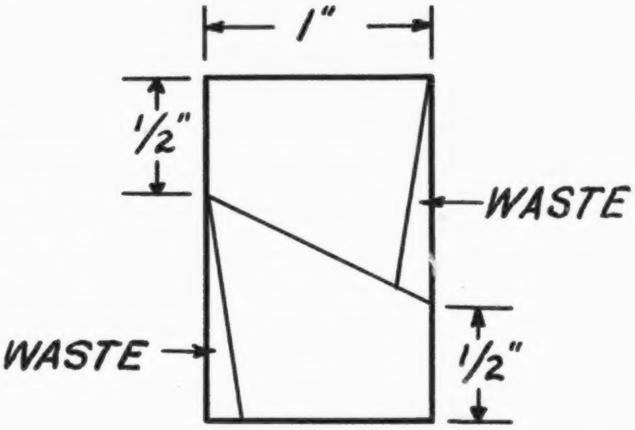

1"
1/2"
WASTE
WASTE
1/2"

Fig.—7–f.

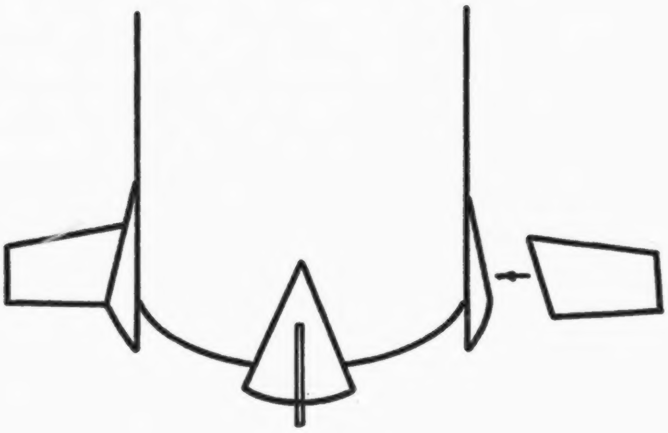


Fig.—7–g.

SECTION 4

Maturity Level—Eight Years[*]

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
All About Satellites and Space Ships. [P]	Language Arts	*Written* a. Write the story of Cape Kennedy. b. Describe the launching of a satellite. c. Write an imaginary story of a trip to the moon or of exploring the moon. d. Write a history of the development of rockets and satellites. *Oral* a. Report on weather and communication satellites. b. Tell about the launching of Alan B. Shepard, Jr.
	Art	*Graphic* Draw pictures of space vehicles and space stations. *Construction* a. Build a table-model space station. b. Build a table model of Cape Kennedy. *Sculpture* From clay, model different kinds of satellites or space stations.
	Arithmetic	*Time* Figure length of trips into space in terms of time needed to make the trip.
	Social Studies	*History* Develop a time line of important events in the development of rockets and satellites. *Current Events* Keep time line up to date with news pictures and stories about satellites.
Balloons Fly High [P]	Language Arts	*Written* Write stories or poems of the history of ballooning.

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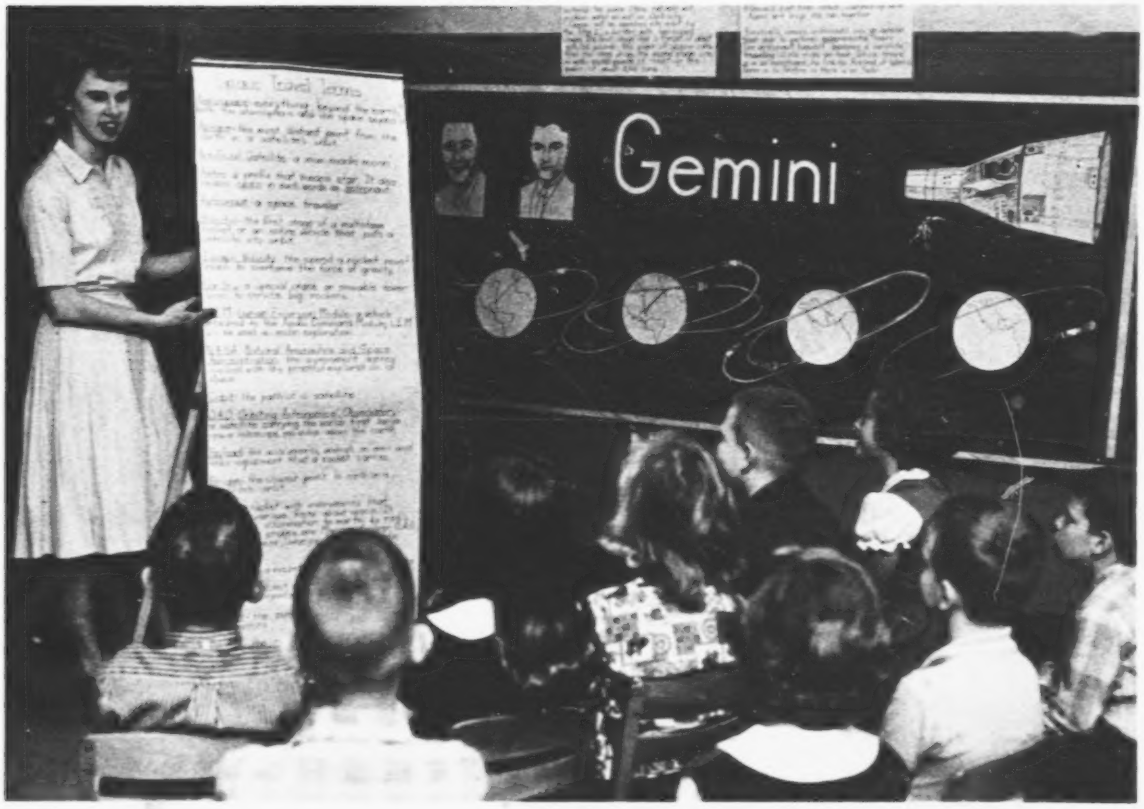
[*] Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

		Oral Make reports on the history of ballooning. *Drama* Dramatize episodes in the development of balloon travel.
	ART	*Graphic* Draw pictures illustrating the history of ballooning. *Construction* Make model balloons and use as mobiles.
	SCIENCE	*Air* a. Demonstrate how an object can rise in air. Float a cork on water. Press it down to bottom of container. Release. Discuss why it rises. b. Demonstrate that hot air rises. In a darkened room hold a lighted candle in a beam of light. Notice, in the shadow, the lines indicating the rising air. c. Demonstrate that air is needed for combustion. Burn a lighted candle under jar. d. Demonstrate how a parachute works. Suspend an object from the four corners of a handkerchief and drop.
Beyond Mars [T]	LANGUAGE ARTS	*Written* a. Write stories or poems of solar sailing to the planets. b. Write stories about what astronauts will find as they land on different planets. c. Write stories about pioneers colonizing a new planet. *Drama* a. Dramatize stories about interplanetary travel. b. Dramatize the story *Beyond Mars*.
A Book of Planets for You [P]	LANGUAGE ARTS	*Written* Write stories or poems about the planets. *Oral* Give reports about the planets.
	ARITHMETIC	*Number Reading* Make chart of planetary sizes and distances from the sun. *Measurement* Compare earth's distance from the sun to the distance of the other planets.
	ART	*Graphic* Draw landscapes of the various planets.

		Construction Make a bulletin board showing part of the orbit of each planet with a portion of the sun at one side. Use distance scale to fit space available.
	SCIENCE	*Rotation and Revolution* Using children to represent the sun and planets, demonstrate the difference between rotation and revolution. Have them "rotate" as they "revolve" around a "sun."



8-1.—Learning space-travel terms.

A Book of Satellites for You [P]	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms (see picture 8-1). *Written* Write stories or poems about satellites.
	ART	*Graphic* Draw pictures of satellites. *Construction* Make paper models of satellites. Hang as mobiles.
	ARITHMETIC	*Size* a. Compare weight of satellites to child's weight.

		b. Compare size of satellites to size of known objects. *Measurement* Compare speed of satellites to speed of car, airplane, etc. *Number Reading* Make chart of size, speed, and weight of satellites.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about satellites.
Countdown: The Story of Cape Canaveral. [T]	LANGUAGE ARTS	*Written* a. Write stories describing the launching of rockets from Cape Kennedy (formerly Cape Canaveral). b. Write the story of the building of Cape Canaveral (which now is called Cape Kennedy). *Reading* Develop a dictionary of "the language of the missilemen." *Oral* Report on the launching of Vanguard, Explorer, etc. *Drama* Dramatize the launching of a rocket.
	ART	*Construction* Build a table model of Cape Kennedy.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about Cape Kennedy.
Discoverer: Story of a Satellite [T]	LANGUAGE ARTS	*Oral* Report on the development of the Discoverer.
	ART	*Construction* Make models of the Discoverer.
The First Book of Space Travel [P]	LANGUAGE ARTS	*Written* Write stories or poems about space travel. *Drama* Dramatize a trip into space. *Oral* Make a tape recording of how we feel as we travel through space.
	ART	*Graphic* Draw pictures of space traveling or of what might be seen in space.
	SCIENCE	*Air* Demonstrate oxygen needed for combustion by attempting to burn material in a sealed container.

		Friction Demonstrate heat caused by friction by rubbing hands together or on a table. *Plants* a. Grow plants with and without soil. b. Grow plants with and without light. c. Compare growth of plants tilted at various angles and hanging upside down. d. Grow plant in an enclosure filled with carbon dioxide.
Guide to Rockets, Missiles, and Satellites ^{T}	LANGUAGE ARTS	*Reading* Develop an aerospace dictionary. *Oral* Report about the different kinds of rockets, missiles, and satellites.
	SOCIAL STUDIES	*History* Develop a time line of the history of rocketry.
	ART	*Graphic* Draw pictures of the different kinds of rockets, missiles, and satellites. *Sculpture* Make clay models of the different kinds of rockets, missiles, and satellites.
The How and Why Wonder Book of Planets and Interplanetary Travel ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems about flights to the moon. b. Write imaginary stories about life on other planets or about living on other planets. *Oral* Report on the dangers in space travel, about the solar system, or on techniques of space navigation.
	ART	*Graphic* Make a chart comparing the different planets.
	SCIENCE	*Planets* Demonstrate reflection of light by the planets. Use a polished metal ball to represent the planet and a light bulb to represent the sun. *Gravity* Demonstrate pull of gravity. Tie a small airplane to string and "fly" it around the head. *Air* a. Demonstrate air resistance. Run with a square of paper held flat against the wind

		and then with the edge against the wind. Notice the difference in resistance. b. Cover lighted candle with an inverted bottle. Notice that candle cannot burn without air.
Let's Go to a Rocket Base ^{P}	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace words. *Written* Write stories of a trip to a rocket base.
	ART	*Graphic* Draw pictures of different kinds of rockets. *Construction* Build a table-model rocket base.
	SOCIAL STUDIES	*Field Trip* Visit a nearby rocket installation.
Man Alive in Outer Space ^{T}	LANGUAGE ARTS	*Written* a. Write stories about some of our space pioneers. b. Write a diary of an astronaut taking tests. *Oral* a. Report about the choosing of the astronauts. b. Report about the problems of keeping man alive in space; i.e., weightlessness, food, isolation, heat, and cold, etc.
	ART	*Graphic* Draw pictures of the experiences of the astronauts preparing for space flight.
	HEALTH	*Food* Pressure can, freeze, dry, and make jam of some kind of fresh fruit. Compare methods of preservation in terms of weight, flavor, appearance, etc.
Man on the Moon ^{P}	LANGUAGE ARTS	*Written* Write stories or poems about a trip to the moon. *Drama* Dramatize a trip to the moon.
	ART	*Graphic* a. Draw pictures of "the man in the moon" or other figures imagined in the moon. b. Draw or paint "moonscapes." *Sculpture* Make imaginary "moonscapes" with clay.

	HEALTH	*Food* Prepare a balanced meal with blender. Put into plastic bags. Eat as an astronaut would eat by squeezing bag.
	SCIENCE	*Sound* Suspend small bell inside a bottle fitted with one-hole stopper containing a glass tube and short piece of rubber tubing which can be clamped closed. Boil small amount of water in bottle long enough to force out all air. Close clamp. Listen for sound of bell in partial vacuum formed when bottle has cooled. *Astronomy* Visit a local observatory to see the moon. *Conservation* a. Sprinkle or pour water on soil to show erosion caused by rain. Note this is not possible on moon. b. Fill milk carton with water and freeze to show expansion of water when frozen. c. Soak a porous rock in water; then freeze it to see if the expansion of the water will crack it.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about our moon project.
Off into Space [P]	LANUGAGE ARTS	*Written* Write stories or poems of adventures as a space traveler.
	ART	*Drama* Dramatize the life of a space traveler. *Graphic* a. Draw pictures of space adventures. b. Make "gravity" pictures with string dipped in tempera paint. Place paper on floor; allow string to fall where gravity will. *Construction* a. Make paper-bag space helmet. b. Make oatmeal-box oxygen tanks. c. Build a table model of a space station.
	SCIENCE	*Air* a. Cover glass tumbler full of water with heavy paper. Turn sidewise and upside down to show that air presses in all directions. b. Try to drink water through a straw (glass tube) fitted into a one-hole stopper which seals the water container airtight.

Gravity

Stand on head. Try to eat a cracker and drink milk through a straw while in this position. Note that gravity is not necessary for swallowing.

Action and Reaction

Inflate balloon. Notice air presses in all directions. When balloon is released air no longer presses in direction of air flow, but continues to press in all other directions and balloon goes in direction opposite to escaping air.

Friction

a. Try walking on surfaces of varying degrees of roughness (rough cement, wooden floor, highly polished surface, ice). Notice that walking is easiest when there is something rough to push against. In space there is nothing to push against.

b. To show that friction causes heat, start a fire using a Boy Scout fire-by-friction drill set.

Evaporation

Add salt to drinking water. Taste the saltiness of it. Boil salted water in covered pan. Collect some of the drops of water that form on the lid. Taste, when cooled, to find that salt has been left in the pan as the water evaporated.

Plants

a. Grow radish seeds on a wet blotter between two pieces of glass placed upright in a container. After five days note direction of growth of roots and stems, and turn the glass upside down. Watch direction of growth of roots and stems.

b. Plant a terrarium in a jar that can be sealed. Start with a layer of charcoal, then a layer of soil. Water sufficiently after planting and seal. Place in a sunny location. Notice how water drops collect and return to the soil.

Project Mercury ^{P}

LANGUAGE ARTS

Written

Write stories or poems of the Project Mercury flights.

Drama

Dramatize the launching and flight sequences of the Mercury capsules.

ART

Construction

Construct a large-scale Mercury capsule using chicken wire for framework. Cover

		with aluminum foil. If possible make it large enough for a child to get into.
Rocket Mouse ^{T}	LANGUAGE ARTS	*Written* a. Write stories about the mouse's adventures. b. Write stories about "How I Would Feel in Space." *Reading* Develop a dictionary of aerospace terms.
	ART	*Graphic* Draw pictures of the rocket mouse at various stages of his adventure. Make "movie" of them.
	SCIENCE	*Air* Show that air pressure on a parachute slows fall of an object. Make a parachute from a piece of cloth. Drop an article without a parachute attached, then with a parachute attached.
Rockets into Space ^{T}	LANGUAGE ARTS	*Written* Write stories about building a space station or about living on the moon. *Drama* Dramatize a day on a space station.
	ART	*Construction* Build a model rocket or space station.
	SCIENCE	*Plants* a. Grow plants with and without soil. b. Grow plants with and without light. c. Compare growth of plants tilted at various angles and hanging upside down. d. Grow plant in an enclosure filled with carbon dioxide.
	SOCIAL STUDIES	*Current Events* Have children bring in pictures and stories about rockets in the news.
The Rockets' Red Glare ^{T}	LANGUAGE ARTS	*Written* a. Write the story of Scott Crossfield's flights in the X–15. b. Write the story of the launching and flight of the Mercury capsule. c. Write stories about the future possibilities of space exploration. *Reading* Develop a dictionary of aerospace terms. *Oral* a. Report about the scientists who have been associated with the development of rocketry.

		b. Report on the tests the astronauts must take to qualify. c. Report on the different methods of packaging food for space travel.
	ART	*Graphic* Draw pictures of the astronauts in their space suits.
	SOCIAL STUDIES	*History* Make a time line showing the development of rocketry. *Current Events* Keep an up-to-date display of pictures and stories of rockets in the news.
	SCIENCE	*Action and Reaction* Have a child wearing roller skates throw a ball. *Gravity* a. Spin a toy gyroscope and notice its resistance to change of direction. b. Throw balls of the same size and weight with different amounts of force. Discuss the paths followed by the balls in falling. c. Twirl around the head a ball tied to a string. Vary the length of the string and notice the varying amount of speed needed to keep it in orbit. Release string and notice direction ball travels. *Air* Open an umbrella. Hold it high above the head and pull it down quickly. Notice the air resistance. *Friction* Pull a piece of rope through the hand quickly to feel the heat caused by friction.
Rockets to the Moon ^{T}	LANGUAGE ARTS	*Written* Write stories about landing on the moon or exploring the moon. *Oral* a. Report on the history of moon exploration. b. Report on the progress of the Apollo project.
	ART	*Graphic* Make a chart showing the moons of other planets. *Construction* a. Make a three-dimensional map of the moon. b. Build a table-model lunar base.

		c. Make clay models of real and imaginary moon rockets.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures about the Apollo project.
Space Book for Young People [P]	ARITHMETIC	*Measurements* a. Make a table of weight comparisons on different planets. b. Make a chart showing comparative sizes and distances of planets.
	ART	*Graphic* Make a mural of our galaxy in space, showing approximate location of our solar system.
	SCIENCE	*Action and Reaction* Demonstrate reaction by having child stand in small wagon and jump out, causing wagon to move in opposite direction.
Space Monkey [P]	LANGUAGE ARTS	*Written* Write stories about Miss Baker's flight. *Drama* Dramatize sending an animal into space.
	ART	*Graphic* Draw pictures of Miss Baker's story and make a booklet of them. *Construction* Construct a rocket of cardboard tubes. Make an oatmeal-box capsule for monkey using clay and cotton to fit and pad it. Make clay monkey to fit in capsule.
	SCIENCE	*Air* a. Place end of a length of glass tubing into water. Cover other end with finger; raise tube out of water. Notice that air pressure keeps water suspended in tube. b. Prick inflated balloon with a pin to demonstrate that air under pressure will escape into area of less pressure. c. Place sheet of asbestos on some source of heat. Notice that side next to heat becomes quite hot, but side away from heat does not. Compare earth's atmosphere, blanketing the earth from the sun's heat, to asbestos sheet.
The Sun, the Moon, and the Stars [P]	LANGUAGE ARTS	*Written* Write stories about the members of the solar system.
	ART	*Graphic* Draw pictures of the members of the solar system.

		Construction Make papier-mâché models of the planets.
	Science	*Gravity* Swing a potato on a string around in a circle. Compare to gravity holding moon in orbit.
		Rotation and Revolution a. Demonstrate, using ball, knitting needle, and orange. b. Have pupils observe and report changes in position of stars at different times on the same night.
		Sun Show the difference between glowing heat and heat from material being consumed, by comparing heat from light bulb to heat from burning paper or wood.
	Arithmetic	*Time* Pretend to travel through the solar system by fast rocket from the sun and note how much older you will be as you reach each planet.
Telstar ^{T}	Language Arts	*Written* Write stories about communicating by satellite.
		Drama Dramatize the launching of Telstar.
	Art	*Graphic* Draw pictures of Telstar in orbit.
	Social Studies	*Current Events* Bring in pictures and stories about communication satellites.
What Does an Astronaut Do? ^{T}	Language Arts	*Written* Write stories about the work of an astronaut.
		Drama Dramatize a trip into space.
	Art	*Graphic* Draw pictures of space vehicles.
		Construction Build a table-model moon base.
	Social Studies	*Current Events* Have children bring in for discussion news pictures and stories about our astronauts.
	Health	*General* Check health of class to see if they would be "eligible" to be astronauts. For example, take height, weight measurements. Count pulse before and after exercise, etc.

Category: Pamphlets, Brochures, and Kits

Aerojet-General Spacelines and Rocket Review T	LANGUAGE ARTS	*Written* Write stories or poems about the Gemini or Apollo projects. *Oral* a. Report on the Gemini or Apollo projects (see picture 8–2). b. Report on the selection and training of astronauts. c. Report on nuclear power for spacecraft.

1970
Apollo
1999
Moon suits and moon bases will keep explorers alive on the airless moon. The experimental suit includes a radio, devices for controlling temperature in the suit, and a place to store food. Explorers will eventually build a lunar base where they could grow food and oxygen producing plants. The dome would be an inflated bag.

8–2.—Preparing a display about the Apollo Project.

America in Space P	LANGUAGE ARTS	*Written* Write stories of the U.S. space program using pictures. *Oral* Report on the U.S. space program using pictures.
America's Space Pilots T	LANGUAGE ARTS	*Written* Write stories about the lives and training of the astronauts.

		Oral Report on the lives and training of the astronauts.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures about astronauts.
Aviation Activities [T]	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms. *Written* Write stories or poems about airplanes. *Drama* Dramatize a trip on an airplane.
	ARITHMETIC	*Number Reading* Read thermometer and keep a daily record of temperature.
	SCIENCE	*Air* Make pinwheels. Use to demonstrate air movement. *Weather* Make a thermometer. Put colored water in bottle fitted with one-hole stopper containing a length of glass tubing. Note how changes in temperature cause water in tube to rise and fall.
	ART	*Construction* a. Make a glider or airplane of paper. b. Make pilot or stewardess hats or earphones.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot, stewardess, or other airport worker to visit class.
Aviation Units for the Primary Grades [T]	LANGUAGE ARTS	*Written* Write about an imaginary airplane trip. *Drama* Dramatize an imaginary airplane trip.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot, stewardess, or other airline worker to visit class. *Community* "Fly" across local community or state pointing out points of interest along the way.
	SCIENCE	*Air* a. Hold a piece of paper just below lower lip. Blow across the top and notice that the paper rises.

2

b. Crumple one of two pieces of paper that are same size. Drop from above the head and notice that crumpled piece offers less air resistance.

c. Make parachute of large handkerchief. Tie object to it. Observe how air slows fall of object.

d. Make kites and fly them. Notice that the angle of attack is important to its flight.

Airplane

a. Make a heavy cardboard model plane with strings to the elevators and ailerons to show how they operate.

b. Through binoculars, watch birds flying.

Action and Reaction

Fasten inflated balloon to small lightweight toy so that when air is released toy will move forward.

ART

Graphic

a. Make a picture book of kinds of airplanes.

b. Make silhouettes of common kinds of airplanes. Use as flashcards for children to identify.

Construction

a. Make paper gliders and airplanes.

b. Have an exhibit of model planes.

c. From sturdy boxes, make an airplane large enough for children to get into.

d. Construct a table-model airport.

e. Construct dioramas of an airport.

f. Make pilot or stewardess hats and radio earphones.

g. Make mobiles of airplanes.

Demonstration Aids for Aviation Education [T]

SCIENCE

Weather

Demonstrate condensation. Place a glass of warm water beside a glass of water containing ice cubes. Discuss the source of the water droplets that form.

Air

a. Show that air takes up room by attempting to fill quickly a bottle equipped with one-hole stopper fitted with a funnel. Insert straw to allow air to leave bottle and notice how water will then go into bottle.

b. Show that air has weight. Balance inflated balloons on a stick suspended by a string. Break one balloon to let air

		escape. Notice balloon filled with air is heavier than empty balloon. c. Show air pressure. Place end of medicine dropper in pan of water. Squeeze and notice air leaving. Release and notice water replaces lost air. Hold dropper in the air and notice that air pressure keeps water in the tube. d. Demonstrate that air moves. Burn a string in a dish and notice direction smoke travels. e. Demonstrate air expands. Heat a lightly stoppered empty test tube until air forces stopper out. f. Show convection currents. Hold smoking punk over source of heat, then over cold surfaces. *Airplane* Demonstrate use of propellers. Move small wagon by means of a fan set in it.
	ARITHMETIC	*Time* Set several clocks according to the time of cities in various parts of the world (or of the U.S.). Compare times with local time.
Earth and Space Guide for Elementary Teachers[T]	SCIENCE	*Moon* a. Demonstrate reflection of light from the sun. Shine a light (sun) on a mirror (moon) and reflect light onto a globe. b. Demonstrate phases of the moon. Carry a ball, lighted by a flashlight, around a globe. *Light* Shine a beam of light in a darkened room. Notice dust particles. Increase amount of particles by adding chalk dust from an eraser. Notice increased brightness as light is reflected from greater number of particles. Note that space is dark because there are no dust particles.
	ART	*Construction* Make a diorama of the solar system. Suspend balls of papier-mâché in a large cardboard box.
Earth Science and Outer Space[T]	ART	*Construction* Make a bulletin board showing the relative sizes of the members of the solar system. *Graphic* Prepare charts showing various facts about the moon; such as, phases, tides, and eclipses.

MATURITY LEVEL—EIGHT YEARS

Footprints on the Moon [T]	LANGUAGE ARTS	*Written* Write a story about a trip to the moon. *Drama* Dramatize the events in an imaginary trip to the moon.
	SOCIAL STUDIES	*Current Events* Bring in news pictures and stories about our lunar exploration project.
	ART	*Graphic* a. Draw pictures of the surface of the moon. b. Draw pictures of a moon base. c. Draw pictures of the Gemini or Apollo spacecraft.
How to Forecast the Weather [P]	SCIENCE	*Weather* a. Visit the weather bureau. b. Try to forecast the weather.
Mike and Nancy Learn About Jets [P]	LANGUAGE ARTS	*Written* Write about a visit to an airport. *Drama* Dramatize a visit like Mike and Nancy's.
	SOCIAL STUDIES	*Field Trip* Visit a local airport. *Resource Person* Invite a pilot or stewardess to talk to the class.
The Mission of Man in Space [T]	LANGUAGE ARTS	*Written* Write stories about lunar exploration.
OAO Model [P]	ART	*Construction* Make paper models of our satellites to use as mobiles.
Space—Challenge and Promise [T]	LANGUAGE ARTS	*Written* Write about the possibilities of future space travel. *Oral* Report on the benefits of space research.
	ART	*Graphic* Draw pictures of present and future space vehicles. *Construction* Build models of present and future space vehicles.
Space Travel [P]	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms. *Written* Describe flying in a spacecraft. *Oral* a. Report on the projected Apollo trip to the moon.

		b. Report on proposed trips to Mars and Venus.
	ARITHMETIC	*Size* Prepare a chart or bulletin board showing the comparative sizes of the launch vehicles or of manned spacecraft. *Scale* Prepare a chart or bulletin board showing vast distances in space.
	SOCIAL STUDIES	*History* a. Develop a time line of the satellites or space probes that have been launched. b. Prepare a time line of the "conquest of space."

8-3.—Launching weather balloons.

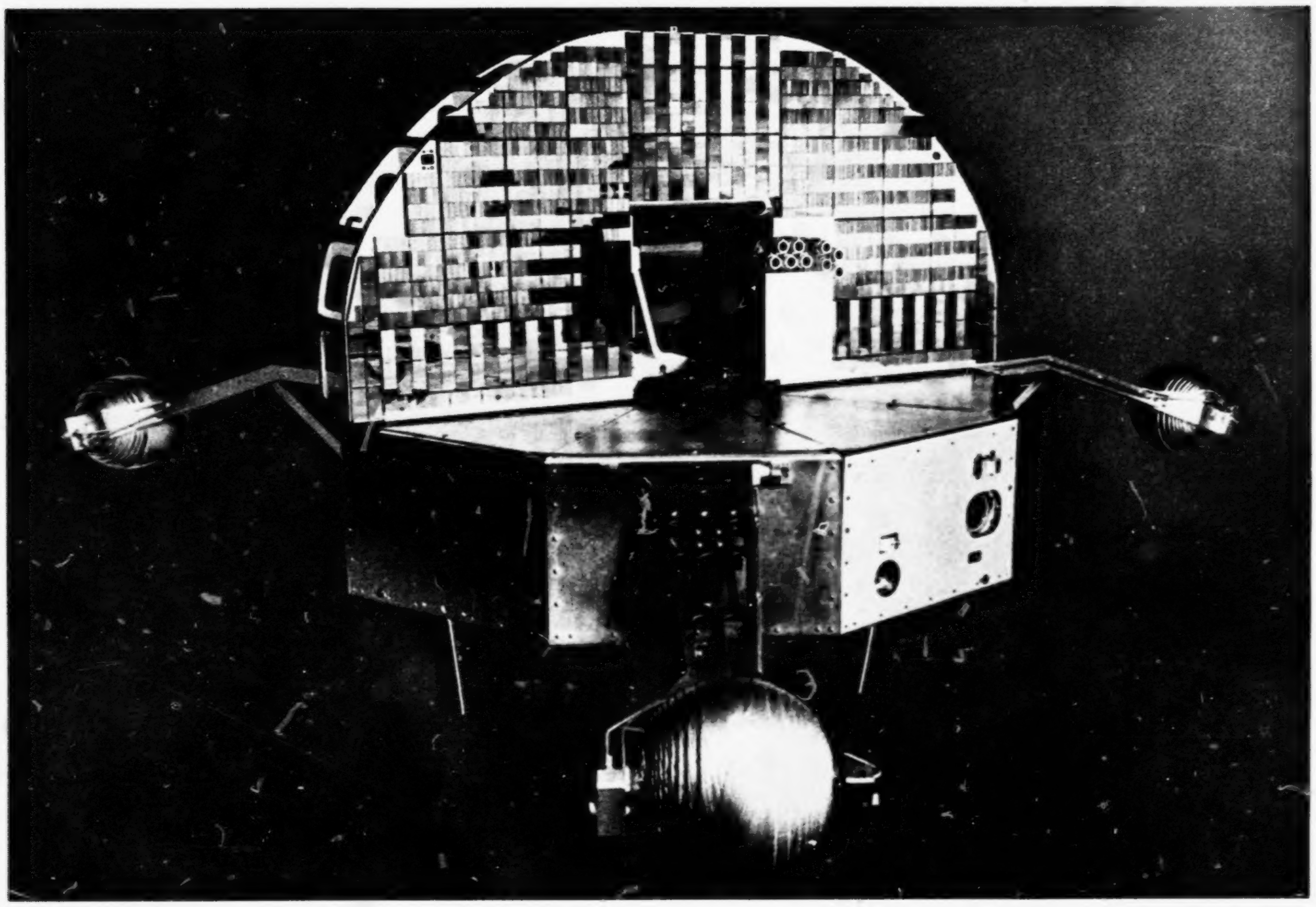
Tilly the Tiger ^{P}	LANGUAGE ARTS	*Written* a. Write a story about Tilly's trip. b. Write a story about an airplane trip. *Drama* Dramatize Tilly's trip, using puppets.
	ART	*Construction* Make puppets of the animal characters.
Weather ^{T}	SCIENCE	*Air* Put a balloon over the mouth of a bottle. Heat bottle to show that air expands when heated. *Weather* a. Make a barometer. Bend glass tube in a U-shape with one short side. Put the

		short side of the "U" into one-hole stopper. Suspend bottle, fitted with stopper and half-filled with water, upside down. Notice changes in level of water as pressure varies. b. Make an anemometer. Fit two pieces of wood together in a cross. Secure four cups (paper) to ends. Mount to swing freely on stand. c. Launch helium-filled balloon to check air currents (see picture 8–3).
A World in Space^{T}	LANGUAGE ARTS	*Oral* Report on the useful things that have resulted from space research.
You and Space^{P}	LANGUAGE ARTS	*Drama* Dramatize sending "astronaut" into orbit.
	ART	*Construction* Make a space suit to fit pupils. Use coveralls, a child's space helmet, gloves, and heavy shoes or boots.

Category: Models

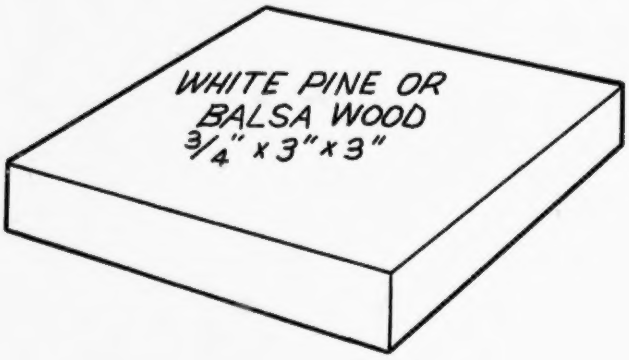
Orbiting Astronomical Observatory: Pictures, Drawings, Directions

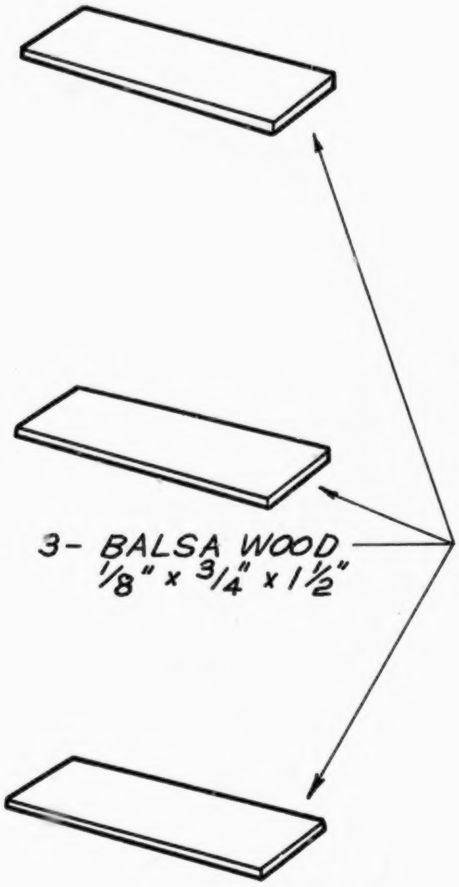
ORBITING SOLAR OBSERVATORY (OSO)

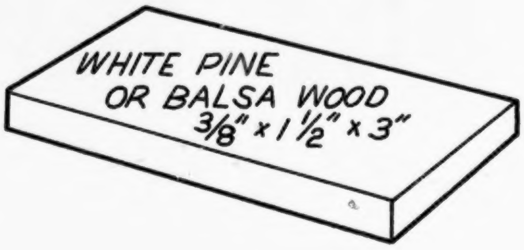


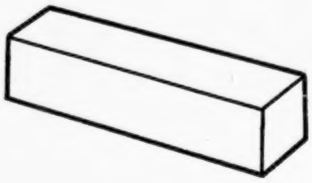
EIGHT YEARS

THE MATERIALS

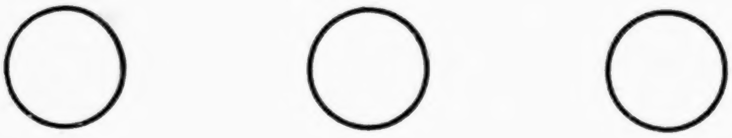

WHITE PINE OR
BALSA WOOD
3/4" x 3" x 3"

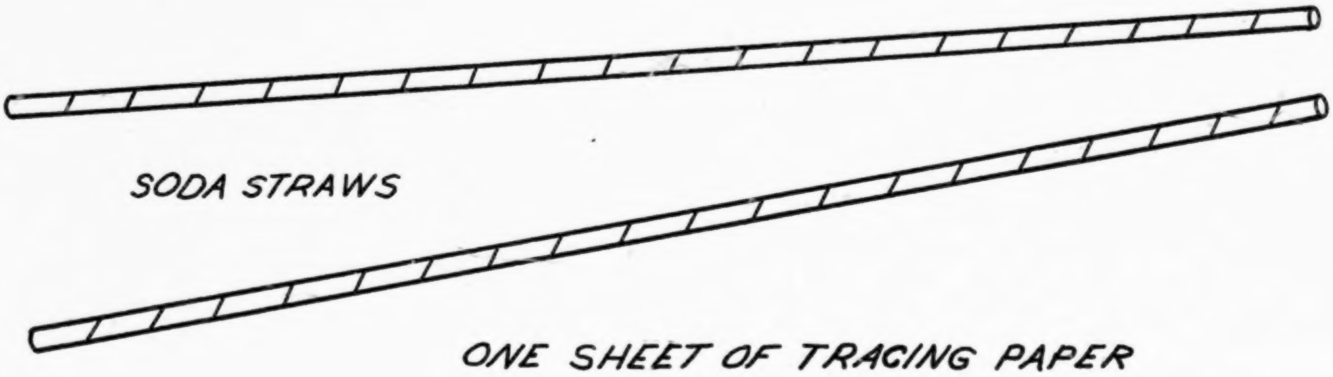

3- BALSA WOOD
1/8" x 3/4" x 1 1/2"


WHITE PINE
OR BALSA WOOD
3/8" x 1 1/2" x 3"


WHITE PINE OR
BALSA WOOD
5/8" x 1/2" x 2 1/8"

MARBLES

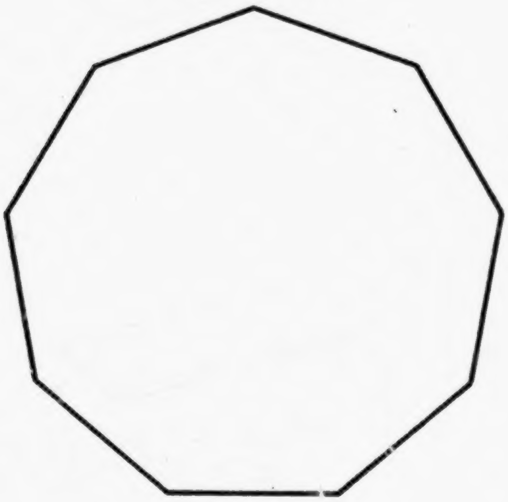



SODA STRAWS

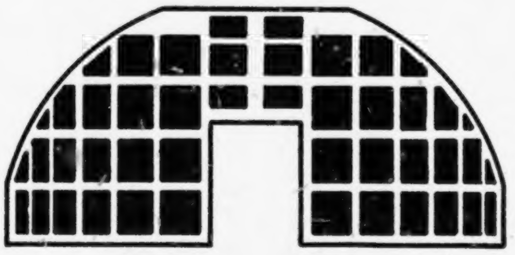
ONE SHEET OF TRACING PAPER

THE PLANS

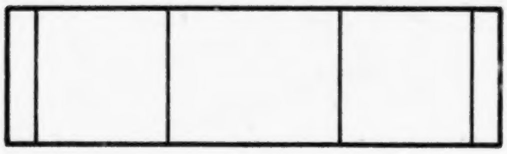
PART A
TOP VIEW



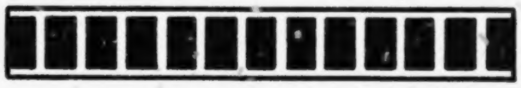
PART B
SIDE VIEW



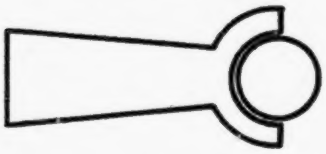
PART A
SIDE VIEW



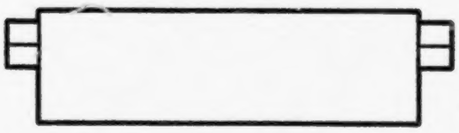
PART B
TOP VIEW



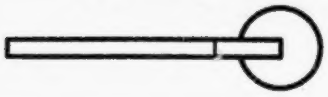
PART D
TOP VIEW



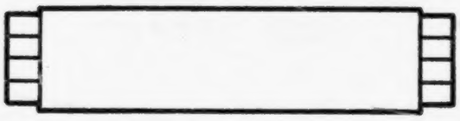
PART C
SIDE VIEW



PART D
SIDE VIEW



PART C
TOP VIEW



Construction

Six basic steps in the construction of a model Orbiting Astronomical Observatory are outlined below.

Step 1

Place tracing paper over the plans and trace the outline of the four parts. Cut out the tracings with scissors. (Wood may be pre-cut and furnished to the children.)

Step 2

Place the tracing of part A, top view, over the ¾ x 3 x 3-inch block. Mark the nine sides on the block and cut with a handsaw or knife.

Step 3

Place the tracing of part B, side view, over the ⅜ x 1½ x 3-inch block. Mark the outer edge and the cut-out at the bottom and cut with handsaw or knife.

Step 4

Part C, the ⅝ x ½ x 2⅛-inch block, is cut to shape. It should fit into the cut-out in part B with ⅞-inch protruding on each side of part B. Glue part C into part B. Glue both part B and part C on the top of part A. Cut soda straws into ¼-inch pieces. Glue eight pieces on each end of part C.

Step 5

Place the tracing of part D over an ⅛ x ¾ x 1½-inch piece of balsa sheet. Cut with knife. Glue marble in the fork of part D. Repeat process for the two other arms. Glue arms to part A at equal distances around part A.

Step 6

1. Paint part A black.
2. Paint parts B and C white or silver.
3. Paint windows on part B black.
4. Paint part D white or silver.

SECTION 5

Maturity Level—Nine Years*

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
All About Satellites and Space Ships[P]	Language Arts	*Written* a. Write the story of Cape Kennedy. b. Describe the launching of a satellite. c. Write an imaginary story of a trip to the moon or of exploring the moon. d. Write a history of the development of rockets and satellites. *Oral* a. Report on weather and communication satellites. b. Tell about the launching of Shepard.
	Art	*Graphic* a. Draw pictures of space vehicles and space stations. b. Draw a mural of the history of flight. *Construction* a. Build a table-model space station (see picture 9–1). b. Build a table-model of Cape Kennedy. *Sculpture* From clay, model different kinds of satellites or space stations.
	Arithmetic	*Time* Figure length of trips into space in terms of time needed to make the trip.
	Social Studies	*History* Develop a time line of important events in the development of rockets and satellites. *Current Events* Keep time line up to date with news pictures and stories about satellites.

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* Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

Balloons Fly High [P]

LANGUAGE ARTS

Written

a. Write an "eyewitness" report of an event in ballooning.

b. Write stories or poems of the history of ballooning.

Oral

a. Report on the history of ballooning.

SPACE STATION

9-1.—Building a model space station.

b. Report on the use of balloons to carry instruments for collecting weather data.

Drama

Dramatize episodes in the development of balloon travel.

ART

Graphic

Draw pictures illustrating the history of ballooning.

Construction

Make model balloons and use as mobiles.

SCIENCE

Air

a. Demonstrate how an object can rise in air. Float a cork on water. Press it down to bottom of container. Release. Discuss why it rises.

b. Demonstrate that hot air rises. In a darkened room hold a lighted candle in

		a beam of light. Notice, in the shadow, the lines indicating the rising air. c. Demonstrate that air is needed for combustion. Burn a lighted candle under jar. d. Demonstrate how a parachute works. Suspend an object from the four corners of a handkerchief and drop.
Beyond Mars ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems of solar sailing to the planets. b. Write stories about what astronauts will find on different planets as they land. c. Write stories about pioneers colonizing a new planet. *Drama* a. Dramatize stories about interplanetary travel. b. Dramatize the story *Beyond Mars.*
Count Down: The Story of Our Missile Bases ^{T}	LANGUAGE ARTS	*Oral* Report on the development of missiles.
	ART	*Construction* a. Build a model Nike base. b. Make models of some of the rockets and missiles.
	SOCIAL STUDIES	*Field Trip* Visit a missile base.
Countdown: The Story of Cape Canaveral ^{P}	LANGUAGE ARTS	*Written* a. Write stories describing the launching of rockets from Cape Kennedy (formerly Cape Canaveral). b. Write the story of the building of Cape Canaveral. *Reading* Develop a dictionary of "the language of the missilemen." *Oral* Report on the launching of Vanguard, Explorer, etc. *Drama* Dramatize the launching of a rocket.
	ART	*Construction* Build a table model of Cape Kennedy.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about Cape Kennedy.
Discoverer: The Story of a Satellite ^{P}	LANGUAGE ARTS	*Oral* Report on the development of the Discoverer.

	ART	*Construction* Make models of the Discoverer.
The First Book of Space Travel ^{P}	LANGUAGE ARTS	*Written* a. Write a log of a trip into space. b. Write stories or poems about space travel. *Drama* Dramatize a trip into space. *Oral* Make a tape recording of how we feel as we travel through space.
	ART	*Graphic* Draw pictures of space traveling or of what might be seen in space.
	SCIENCE	*Air* Demonstrate oxygen needed for combustion by attempting to burn material in a sealed container. *Plants* a. Grow plants with and without soil. b. Grow plants with and without light. c. Compare growth of plants tilted at various angles and hanging upside down. d. Grow plant in an enclosure, filled with carbon dioxide. *Light* Build a model refracting telescope using reading glasses.
	ARITHMETIC	*Computation* Show size of solar system by figuring how long it will take to reach each planet, traveling in a craft with a speed of 2000 miles per hour. *Measurement* Using earth's distance from the sun, compare distances of other planets from the sun.
First Men to the Moon ^{T}	LANGUAGE ARTS	*Oral* Describe the launching of a moon rocket. *Drama* Dramatize the story of *First Men to the Moon.*
	ART	*Construction* a. Make a three-dimensional map of the moon. b. Make a table-model lunar vehicle.
	SCIENCE	*Heat* Compare absorption of heat by light and dark colors. Place thermometers under each of two pieces of paper, one light and

		one dark. Place in the sun and compare temperatures.
	ARITHMETIC	*Time* Figure Greenwich time for various times of day.
Guide to Rockets, Missiles, and Satellites ^{P}	LANGUAGE ARTS	*Reading* Develop an aerospace dictionary. *Oral* Report about the different kinds of rockets, missiles, and satellites.
	SOCIAL STUDIES	*History* Develop a time line of the history of rocketry. *Current Events* Keep time line up-to-date with news pictures and stories about rocketry.
	ART	*Graphic* Draw pictures of the different kinds of rockets, missiles, and satellites. *Sculpture* Make clay models of the different kinds of rockets, missiles, and satellites.
The How and Why Wonder Book of Planets and Interplanetary Travel ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems about flights to the moon. b. Write imaginary stories about life on other planets or about living on other planets. c. Develop a "travel folder" for travelers to other planets. *Oral* Report on the dangers in space travel, about the solar system, or on techniques of space navigation.
	ART	*Graphic* a. Make a chart comparing the different planets. b. Make a chart or bulletin board of the layers of the atmosphere. c. Make diagrams of rocket and jet motors.
	ARITHMETIC	*Time* a. Figure distance in terms of light years. b. Using stop watch, test reaction time of children.
	SCIENCE	*Planets* Demonstrate reflection of light by the planets. Use a polished metal ball to represent the planet and a light bulb to represent the sun.

Man Alive in Outer Space ^{P}	LANGUAGE ARTS	*Written* a. Write stories about some of our space pioneers. b. Write the diary of an astronaut taking tests. *Oral* a. Report about the choosing of the astronauts. b. Report about the problems of keeping man alive in space: i.e., weightlessness, food, isolation, heat and cold, etc.
	ART	*Graphic* Draw pictures of the experiences of the astronauts preparing for space flight.
	SCIENCE	*Heat* Demonstrate insulation properties of various materials. Fill two small jars with water of the same temperature. Place one into a larger container. Place both in sunlight. Notice differences in temperature of water. Repeat, filling air space in large container with various materials, such as sawdust, soil, etc.
Man on the Moon ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems about a trip to the moon. b. Collect ideas and write stories about moon myths. *Drama* Dramatize a trip to the moon.
	ART	*Graphic* a. Draw pictures of "the man in the moon" or other figures imagined in the moon. b. Draw or paint "moonscapes."
	HEALTH	*Food* Prepare a balanced meal with blender. Put into plastic bags. Eat as an astronaut would eat by squeezing bag.
	SCIENCE	*Sound* Suspend small bell inside bottle fitted with one-hole stopper containing a glass tube and short piece of rubber tubing which can be clamped closed. Boil small amount of water in bottle long enough to force out all air. Close clamp. Listen for sound of bell in partial vacuum formed when bottle has cooled.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about our moon project.

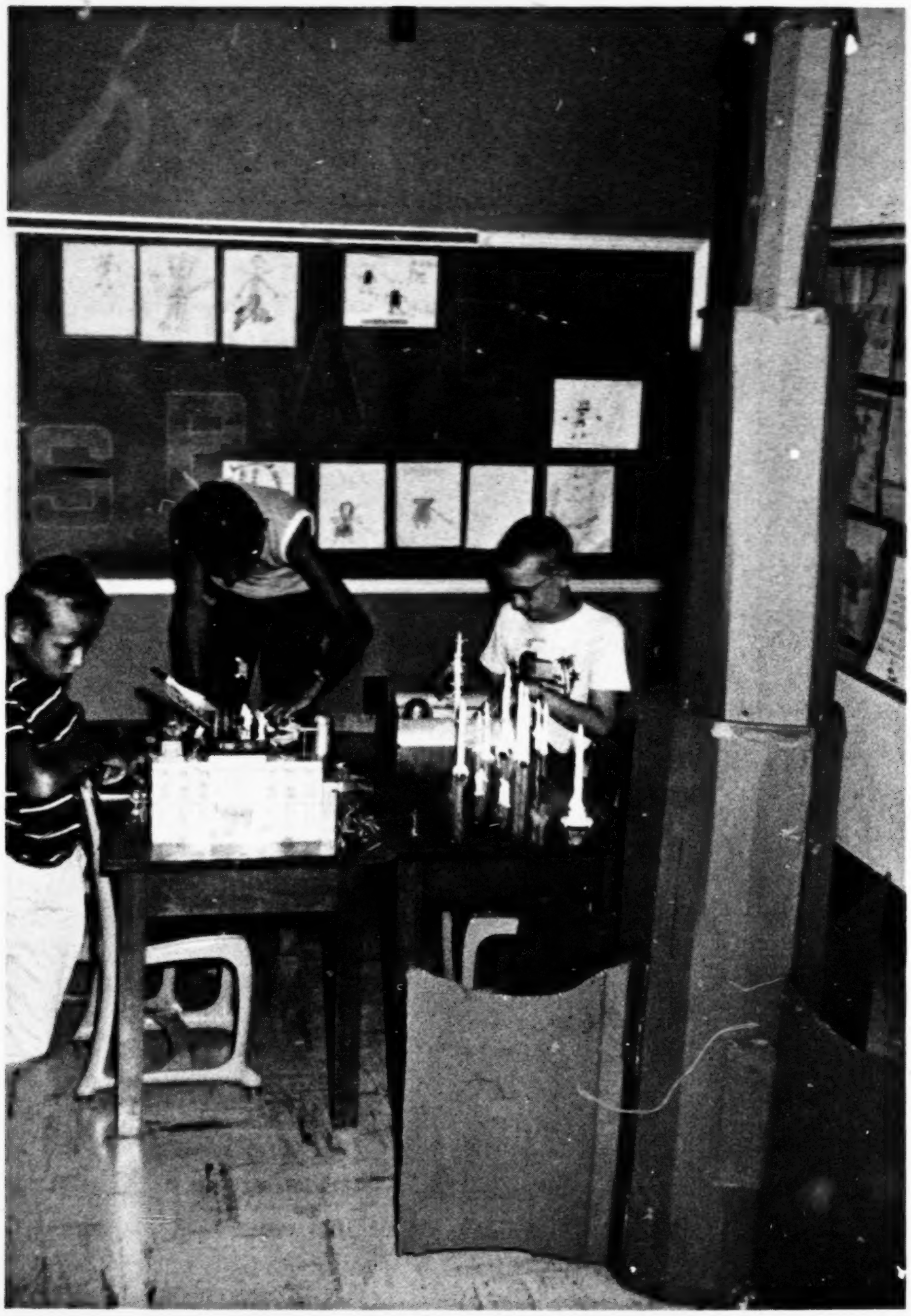
		Field Trip Visit an observatory or planetarium (see picture 9–2).
Off into Space[P]	LANGUAGE ARTS	*Written* Write stories or poems of adventures as a space traveler. *Drama* Dramatize the life of a space traveler.
	ART	*Graphic* Draw pictures of space adventures.

9–2.—Observing the moon through an observatory telescope.

	SCIENCE	*Action and Reaction* Inflate balloon. Notice air presses in all directions. When balloon is released, air no longer presses in direction of air flow, but continues to press in all other directions and balloon goes in direction opposite to escaping air. *Evaporation* Add salt to drinking water. Taste saltiness of it. Boil salted water in covered pan. Collect some of the drops of water that form

		on the lid. Taste, when cooled, to find that salt has been left in the pan as the water evaporated. *Plants* Plant a terrarium in a jar that can be sealed. Start with a layer of charcoal, then a layer of soil. Water sufficiently after planting and seal. Place in a sunny location. Notice how water drops collect and return to the soil.
Project Mercury ^{P}	Language Arts	*Written* a. Write the imaginary log of a Mercury flight. b. Write stories or poems of the Project Mercury flights. *Drama* Dramatize the launching and flight sequences of the Mercury capsules.
	Art	*Graphic* Draw pictures of the Mercury capsule at various stages of its flight.
Rocket Aircraft USA ^{P}	Language Arts	*Oral* Report on various kinds of rocket aircraft.
	Art	*Construction* Make models of various rocket aircraft (see picture 9–3).
	Social Studies	*History* Make a time line of the development of rocket aircraft.
Rocket Mouse ^{P}	Language Arts	*Written* a. Write stories about the mouses' adventures. b. Write stories about "How I Would Feel in Space." Develop a dictionary of aerospace terms.
	Art	*Graphic* Draw pictures of the rocket mouse at various stages of his adventure.
Rocket Power ^{P}	Language Arts	*Oral* Report on various kinds of rockets.
	Art	*Construction* Make models of various rockets.
	Social Studies	*History* Make a time line of the development of rocket power.
	Science	*Action and Reaction* List as many examples as possible of everyday use of the principle of action and reaction.

Rockets into Space P	LANGUAGE ARTS	*Written* Write stories about building a space station or about living on the moon.



9–3.—Building rocket models to different scales.

		Drama Dramatize a day on a space station.
	ART	*Construction* Build a model rocket or space station.

	SOCIAL STUDIES	*Current Events* Have children bring in pictures and stories about rockets in the news.
The Rockets' Red Glare [P]	LANGUAGE ARTS	*Written* a. Write the story of Scott Crossfield's flights in the X–15. b. Write the story of the launching and flight of the Mercury capsule. c. Write stories about the future possibilities of space exploration. *Oral* a. Report about the scientists who have been associated with the development of rocketry. b. Report on the tests the astronauts must take to qualify. c. Report on the different methods of packaging food for space travel. *Reading* Develop a dictionary of aerospace terms.
	ART	*Graphic* Draw pictures of the astronauts in their space suits.
	SOCIAL STUDIES	*History* Make a time line showing the development of rocketry. *Current Events* Keep an up-to-date display of pictures and stories of rockets in the news.
	SCIENCE	*Action and Reaction* Have a child wearing roller skates throw a ball. a. Spin a toy gyroscope and notice its resistance to change of direction. b. Twirl around the head, a ball tied to a string. Vary the length of the string and notice the varying amount of speed needed to keep it in orbit. Release string and notice direction ball travels.
	HEALTH	*Food* Pressure can, freeze, dry, and make jam of some kind of fresh fruit. Compare methods of preservation in terms of weight, flavor, appearance, etc.
Rockets to the Moon [P]	LANGUAGE ARTS	*Written* Write stories about landing on the moon or exploring the moon. *Oral* a. Report on the history of moon exploration.

		b. Report on the progress of the Apollo project.
	Art	*Graphic* Make a chart showing the moons of other planets. *Construction* a. Make a three-dimensional map of the moon. b. Build a table-model lunar base. c. Make clay models of real and imaginary moon rockets.
	Science	*Moon* Observe the moon through strong field glasses.
Space Book for Young People ^{P}	Language Arts	*Written* Write stories of superstitions about the sky and space. *Oral* Report on sounding rockets, satellites, or space probes.
	Arithmetic	*Measurements* a. Make a table of weight comparisons on different planets. b. Make a chart showing comparative sizes and distances of planets.
	Art	*Graphic* a. Make a mural of our galaxy in space, showing approximate location of our solar system. b. Make a bulletin board of the history of rocket development showing comparative size of rockets. *Printing* Make potato or linoleum prints using symbols of planets.
	Science	*Action and Reaction* Demonstrate reaction by having child stand in small wagon and jump out, causing wagon to move in opposite direction.
Space Monkey ^{P}	Language Arts	*Written* Write stories about Miss Baker's flight. *Drama* Dramatize the story of Miss Baker.
	Art	*Graphic* Draw pictures of Miss Baker's story.
	Science	*Air* a. Prick inflated balloon with a pin to demonstrate that air under pressure will escape into area of less pressure.

		b. Place sheet of asbestos on some source of heat. Notice that side next to heat becomes quite hot, but side away from heat does not. Compare earth's atmosphere, blanketing the earth from the sun's heat, to the asbestos sheet.
The Sun, the Moon, and the Stars^{P}	LANGUAGE ARTS	*Written* a. Write stories about the legends of stars and constellations. b. Write stories about the members of the solar system.
	ART	*Graphic* Draw pictures of the members of the solar system. *Construction* Make papier-mâché models of the planets.
	SCIENCE	*Rotation and Revolution* a. Demonstrate, using ball, knitting needle, and orange. b. Have pupils observe and report changes in position of stars at different times on the same night. *Seasons* a. Demonstrate. Use ball, knitting needle, and orange. Keep needle constantly slanted toward north. b. Have pupils observe and record which constellations are highest in the sky each month.
	ARITHMETIC	*Time* Pretend to travel through the solar system by fast rocket from the sun and note how much older you will be as you reach each planet.
Telstar^{T}	LANGUAGE ARTS	*Written* Write stories about communicating by satellite. *Drama* Dramatize the launching of Telstar. *Oral* Report about communication satellites.
	ART	*Graphic* Draw pictures of Telstar in orbit. *Construction* Make a model of Telstar, using construction paper or papier-mâché.
	SOCIAL STUDIES	*Current Events* Bring in pictures and stories about communication satellites.

		History Develop a time line of the history of communication.
What Does an Astronaut Do?[P]	LANGUAGE ARTS	*Written* a. Write stories about the work of an astronaut. b. Write the diary of a space pilot. *Drama* Dramatize a trip into space.
	ART	*Graphic* Draw pictures of space vehicles. *Construction* Build a table-model moon base.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about our astronauts.
	HEALTH	*General* Check health of class to see if they would be "eligible" to be astronauts. For example, take height and weight measurements, count pulse before and after exercise, etc.

Category: Phamphlets, Brochures, and Kits

Aerojet-General Spacelines and Rocket Review[T]	LANGUAGE ARTS	*Written* Write stories or poems about the Gemini or Apollo projects. *Oral* a. Report on the Gemini or Apollo projects. b. Report on the selection and training of astronauts. c. Report on nuclear power for spacecraft.
America in Space[P]	LANGUAGE ARTS	*Written* Write stories of the U.S. space program. *Oral* Report on the U.S. space program using pictures.
America's Space Pilots[P]	LANGUAGE ARTS	*Written* a. Write a letter to a favorite astronaut. b. Write stories about the lives and training of the astronauts. *Oral* Report on the lives and training of the astronauts.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures about astronauts.

Aviation Units for the Intermediate Grades [T]

LANGUAGE ARTS

Written

a. Write a letter to an airport worker inviting him to visit. Write a thank-you letter following the visit.

b. Write about the uses of your local airport.

Reading

Build an aerospace vocabulary.

Oral

Dramatize communication between a control tower and pilot.

FLIGHTS
REGION
HILLS
Wind Tunnel
OUR EXPERIENCES WITH THE WIND TUNNEL
1 We made the wind tunnel
2 We tested a paper wing
3 We tested a flat paper
4 We tested a plastic airplane

9–4.—Testing an airfoil in a model wind tunnel.

ART

Graphic

Draw pictures of airport scenes.

Construction

a. Build a model airport.

b. Make a wind sock and weather vane.

ARITHMETIC

Computation

Figure distances and flight time between cities.

SOCIAL STUDIES

Field Trip

Visit the local airport.

Maps and Globes

Follow airline routes on maps or globes.

Demonstration Aids for Aviation Education [T]	SCIENCE	*Air* a. Demonstrate air expands. Heat a lightly stoppered empty test tube until air forces stopper out. b. Show convection currents. Hold smoking punk over source of heat, then over cold surfaces. c. Demonstrate Bernoulli's principle. Suspend ping-pong ball in stream of air formed by vacuum cleaner with hose attached to blower end. d. Make a wind tunnel of cardboard carton with plastic "window." Use fan to generate wind. Use to test airfoils (see picture 9–4).
	ARITHMETIC	*Time* Set several clocks according to the time of cities in various parts of the world (or of the U.S.). Compare times with local time.
Earth and Space Guide for Elementary Teachers [T]	LANGUAGE ARTS	*Written* Write an "eyewitness" account of the appearance of Halley's comet. *Drama* Dramatize life on a space station.
	ART	*Graphic* Draw or paint imaginary creatures to be found on other planets. *Construction* a. Make a diorama of the solar system. Suspend balls of papier-mâché in a large cardboard box. b. Dress a doll in a model space suit. c. Make a diorama of the Big Dipper.
	ARITHMETIC	*Size* Compare relative sizes of earth and sun, earth and moon, or earth and other planets.
	SCIENCE	*Solar System* a. Observe planets in the night sky. Check newspapers for listings of visible planets. b. Demonstrate radiant heat of the sun. Use example of light bulb or a radiometer toy from toy shop. c. Prepare a chart or diagram illustrating the causes of solar and lunar eclipses. *Light* a. Simulate twinkling of stars. Focus light source on a screen. Place source of

		heat near lens so that rising heat waves will cause light to flicker. b. Shine a beam of light in a darkened room. Notice dust particles. Increase amount of particles by adding chalk dust from an eraser. Notice increased brightness as light is reflected from greater number of particles. Note that space is dark because there are no dust particles.
		Gravity a. Demonstrate inertia versus gravity. Swing ball on an elastic string around head. b. Demonstrate inertia versus gravity. Push two balls off table with unequal force. Notice that one pushed hard falls in arc, while other falls amost straight down. c. Demonstrate force of inertia. Catch ball with elbows rigid, then by "following through" with the motion of the ball. Notice the difference in the force of the stop.
		Centrifugal Effect Swing bucket of water overhead. Notice that water stays in bucket. Discuss why it does.
		Stars Place well-known constellations on inside of umbrella in appropriate places with North Star in center. Rotate to show circumpolar movement.
	SOCIAL STUDIES	*Current Events* Keep an up-to-date chart of events in space exploration.
Earth Science and Outer Space [P]	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms.
	ART	*Graphic* Prepare charts showing various facts about the moon: such as, phases, tides, and eclipses.
		Construction Make a bulletin board showing the relative sizes of the members of the solar system.
	SOCIAL STUDIES	*History* Make time line showing satellites and space probes launched.
Footprints on the Moon [T]	LANGUAGE ARTS	*Written* Write a story about a trip to the moon.

Oral

a. Report on the history of lunar exploration.

b. Report on the training of the astronauts.

c. Report on the problems of lunar exploration.

Drama

Dramatize the events in an imaginary trip to the moon.

FORCASTING

Our Trip
We went to the US Weather Bureau.
We saw their weather instruments.
We learned about the weather code.
We learned about many things.

Our Science Club
We meet on Fridays.
We proved:
water has "skin"
hot air rises
cold air descends.
We learned how frost, rain, and wind are caused.

9–5.—Broadcasting the weather forecast.

	SOCIAL STUDIES	*Current Events* Bring in news pictures and stories about our lunar exploration project.
	ART	*Graphic* a. Draw pictures of the surface of the moon. b. Draw pictures of a moon base. c. Draw pictures of the Gemini or Apollo spacecrafts.
How to Forecast the Weather[P]	SCIENCE	*Weather* a. Visit the weather bureau. b. Try to forecast the weather (see picture 9–5).
The Mission of Man in Space[T]	LANGUAGE ARTS	*Written* Write stories or poems about lunar exploration.

MATURITY LEVEL—NINE YEARS

OAO Model ^{P}	ART	*Construction* Make paper models of our satellites, to use as mobiles.
Our Orbiting Observatories ^{P}	LANGUAGE ARTS	*Oral* Report on the orbiting observatory satellites.
Rockets and Space Vehicles ^{P}	LANGUAGE ARTS	*Oral* a. Report on the scientists associated with the development of space vehicles. b. Report on spacecraft subsystems: propulsion, navigation, biotechnical, etc. c. Report on the different kinds of spacecraft. d. Report on nuclear-powered space vehicles.
Skylights ^{P}	LANGUAGE ARTS	*Written* Write stories using current events as the plot.
	SOCIAL STUDIES	*Current Events* Report current events concerning aerospace.
Smithsonian Institution Information Leaflets ^{P}	LANGUAGE ARTS	*Written* a. Write biographies of men important in history of flight. b. Write stories based upon events in the lives of men important in the history of flight. *Drama* a. Dramatize the events in the lives of men important in the history of flight. b. Prepare an "eyewitness" radio program concerning important event in aviation.
Space—Challenge and Promise ^{P}	LANGUAGE ARTS	*Written* Write about the possibilities of future space travel. *Oral* Report on the benefits of space research.
	ART	*Graphic* Draw pictures of present and future space vehicles. *Construction* Build models of present and future space vehicles.
Space Talk ^{P}	LANGUAGE ARTS	*Written* Use dictionary to help write space stories.

Drama

Use dictionary to help dramatize space stories.

Space Travel^{P}

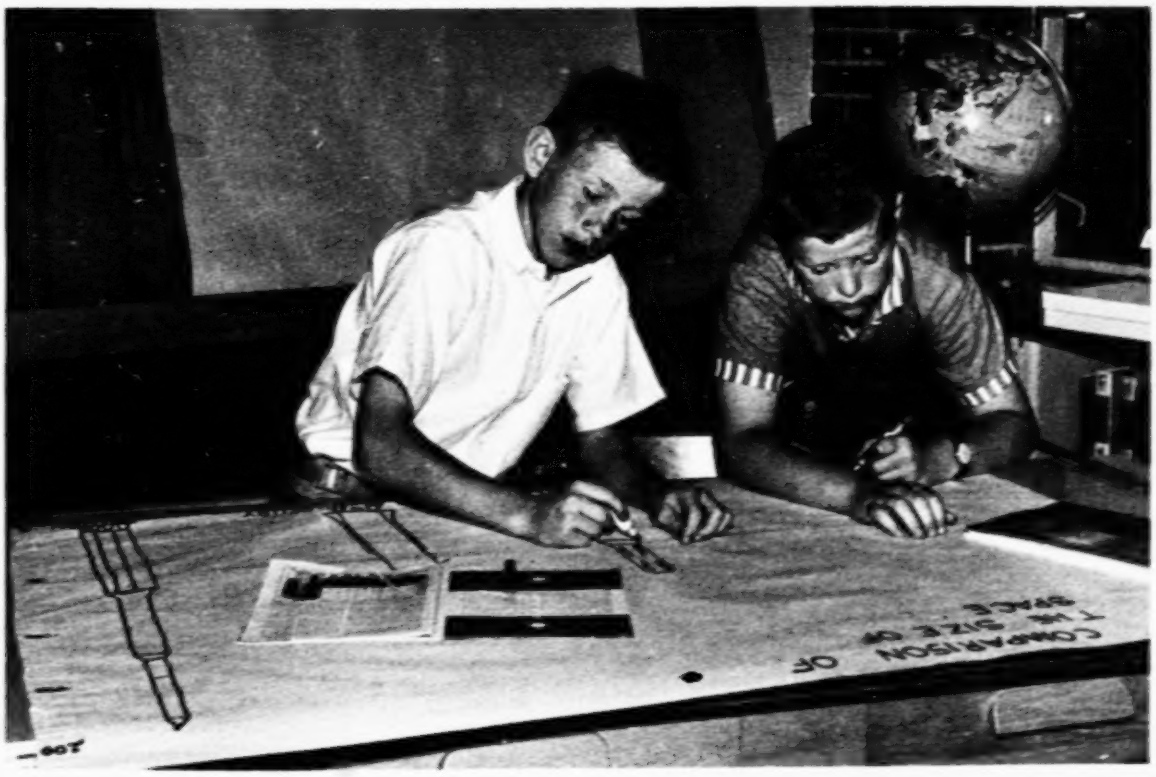
LANGUAGE ARTS

Reading

Develop a dictionary of aerospace terms.

Written

Describe flying in a spacecraft.


COMPARISON OF THE SIZE OF SPACE

9–6.—Preparing a chart showing the relative size of space vehicles.

Oral

a. Report on the projected Apollo trip to the moon.

b. Report on proposed trips to Mars and Venus.

ARITHMETIC

Size

Prepare a chart or bulletin board showing the comparative sizes of the launch vehicles or of manned spacecraft (see picture 9–6).

Scale

Prepare a chart or bulletin board showing vast distances in space.

SOCIAL STUDIES

History

a. Develop a time line of the satellites or space probes that have been launched.

b. Prepare a time line of the "conquest of space."

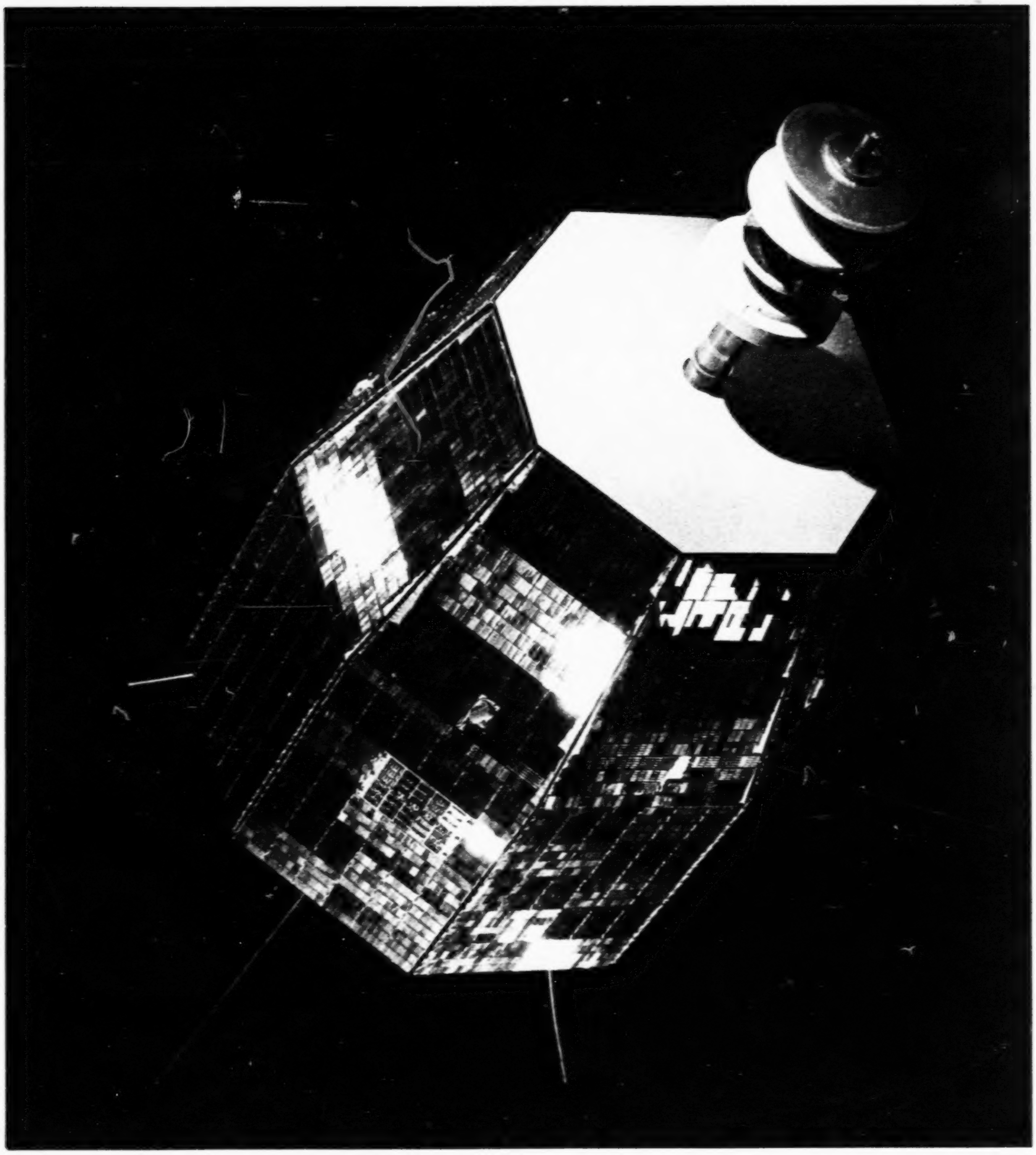
MATURITY LEVEL—NINE YEARS

The Triumph of Astronaut L. Gordon Cooper, Jr., and the Faith 7 ^{P}	LANGUAGE ARTS	*Written* Write the story of Cooper's flight. *Oral* Report on Cooper's flight.
	SCIENCE	*Heat* Compare the amount of heat absorbed. Place thermometer in each of two cans, one painted dull black, the other shiny metal. Take readings of the thermometers after the cans have been in the sun for a while.
	SOCIAL STUDIES	*History* Make a time line showing the chronology of the Mercury project tests. *Maps and Globes* a. Locate tracking stations on map or globe. b. Trace with colored thread the orbit of Cooper's flight.
A World in Space ^{T}	LANGUAGE ARTS	*Oral* Report on the useful things that have resulted from space research.

Category: Models

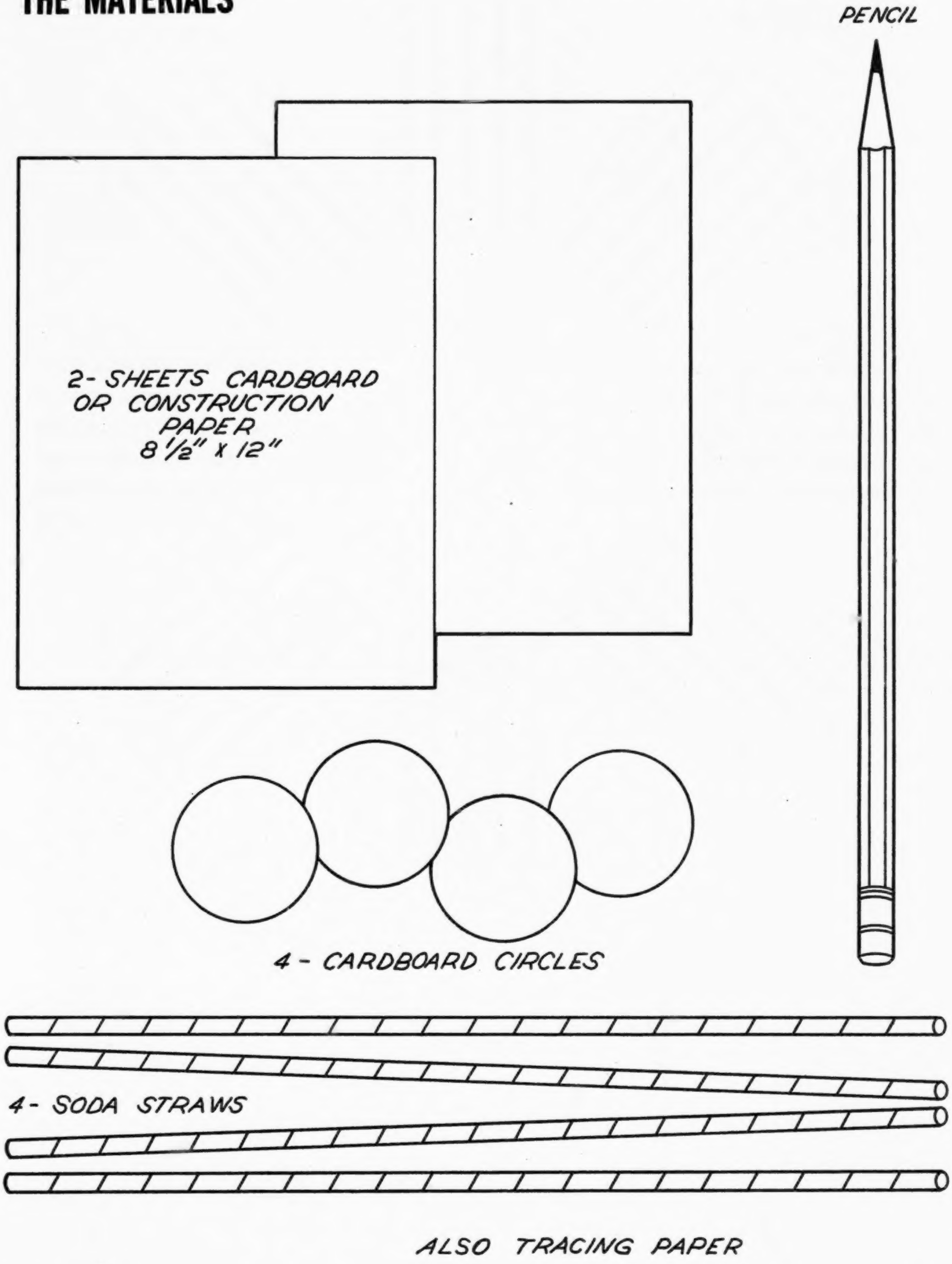
Relay Satellite: Picture, Drawings, Directions

COMMUNICATIONS SATELLITE RELAY

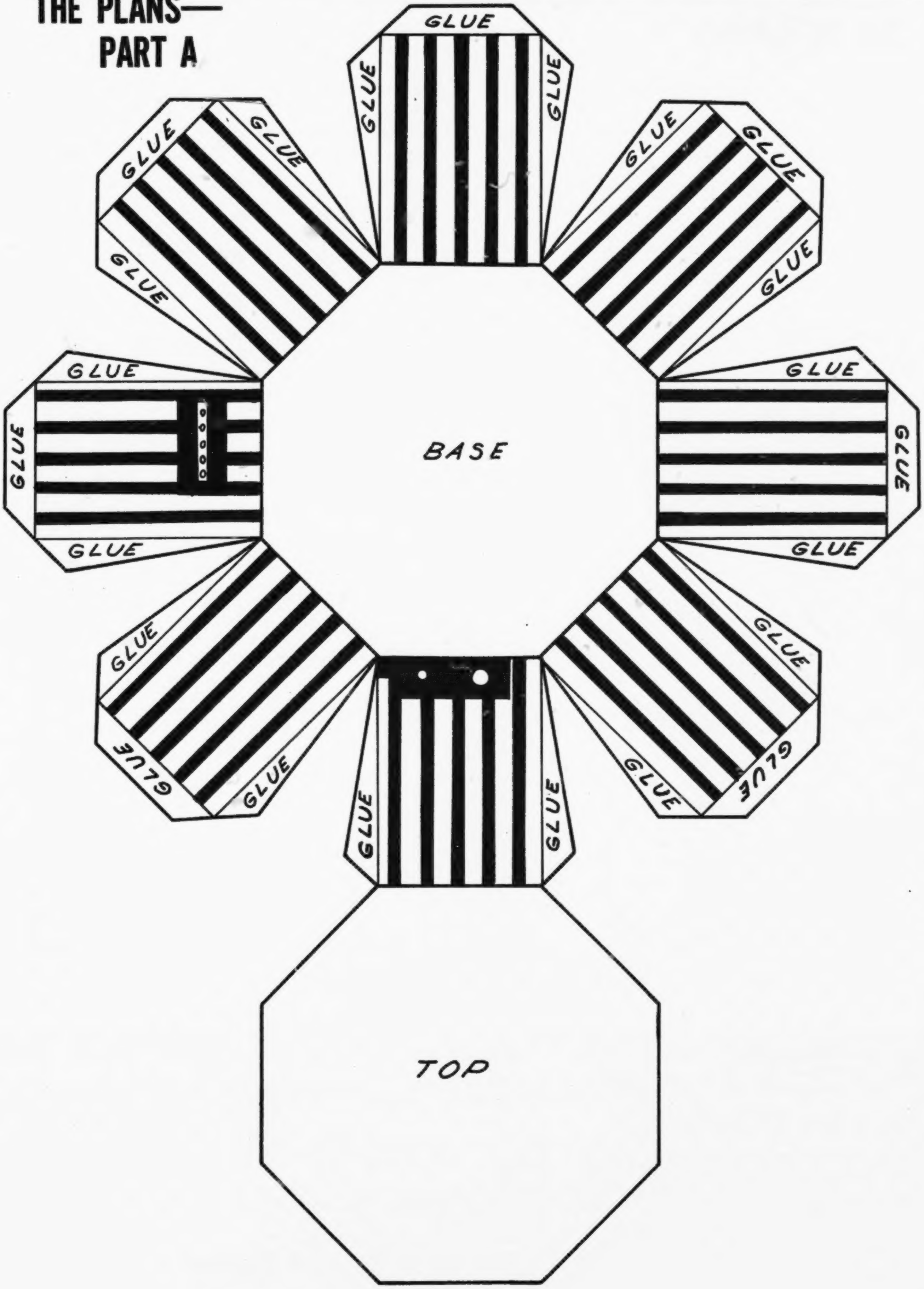


NINE YEARS

THE MATERIALS


PENCIL
2- SHEETS CARDBOARD OR CONSTRUCTION PAPER 8 1/2" x 12"
4 - CARDBOARD CIRCLES
4 - SODA STRAWS
ALSO TRACING PAPER

THE PLANS—PART A


GLUE
GLUE
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BASE
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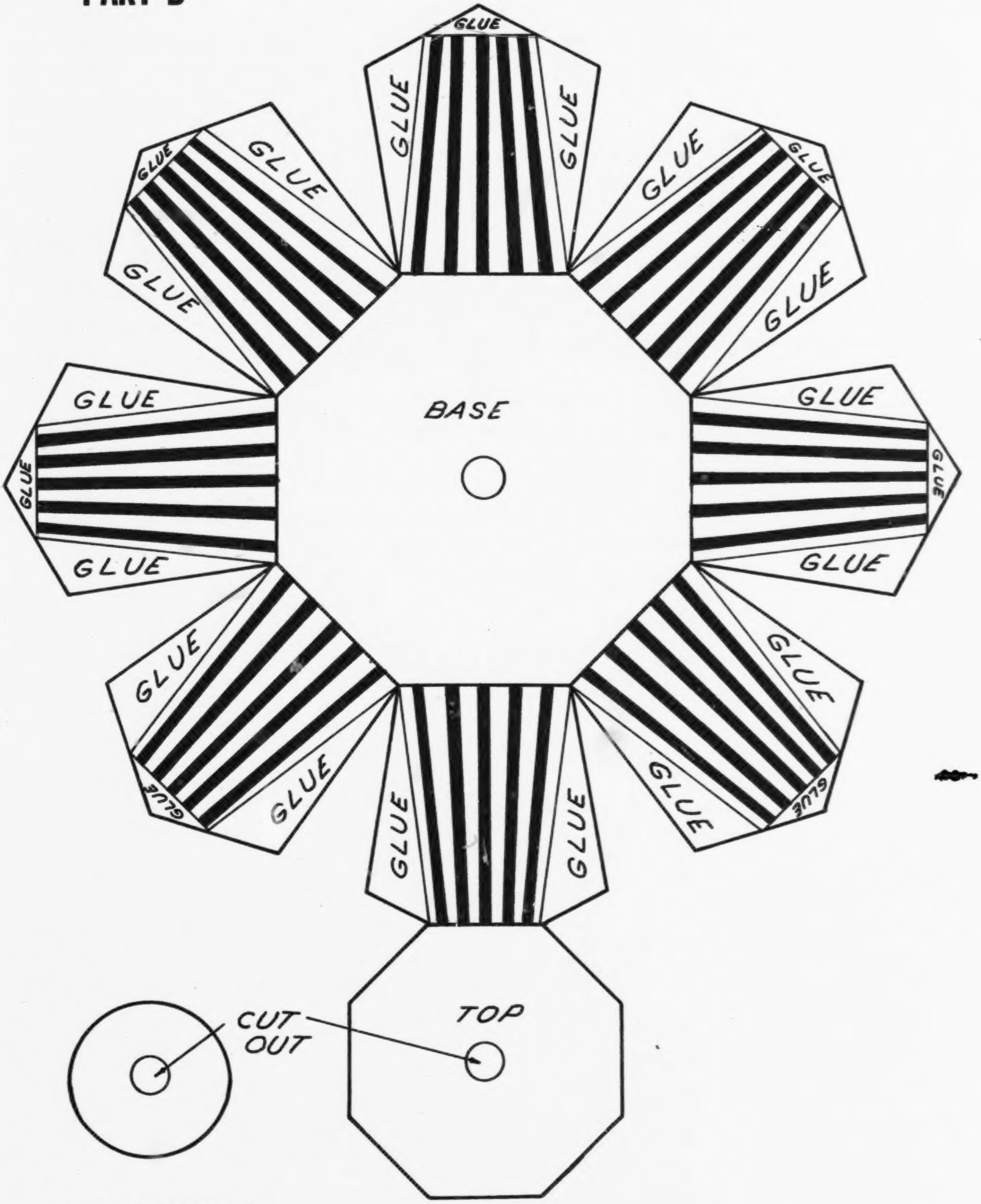
GLUE
TOP

THE PLANS—
PART B


GLUE
BASE
TOP
CUT OUT

4 REQUIRED

Construction

Three basic steps in the construction of a model Relay Communications Satellite are outlined below.

Step 1

Place tracing paper over plans for part A. Trace part A. Cut out tracing with scissors and glue the outline on cardboard or construction paper. Punch the four antenna holes in the base of part A. Fold all the glue tabs toward the center. Fold side panels up. Apply glue to all glue tabs and glue panels together. Fold top over and fasten to glue tabs. See figure 9–a.

Step 2

Repeat instructions for part A with part B. When part B is completed, glue base of part B to top of part A.

Step 3

Insert pencil into hole in the center of part B. Glue in place. Space four cardboard circles on the pencil as shown in the photograph. Cut soda straws into 4-inch lengths. Insert into base of part A as illustrated in the photograph. Paint entire model with white or silver paint.

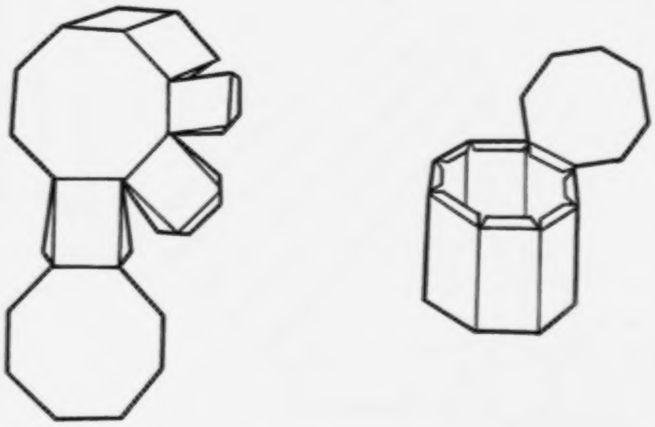


Fig.—9–a.

SECTION 6

Maturity Level—Ten Years[*]

INSTRUCTIONAL MATERIALS	CONTENT AREAS	ACTIVITIES
Category: Books		
Alive in Space [P]	LANGUAGE ARTS	*Written* Write stories about the experimentation being done to solve problems of space travel. *Oral* a. Report on the problems to be solved before space travel is feasible. b. Report on the selection and training of astronauts.
	SCIENCE	*Inertia* Place a doll in sitting position in a box mounted on a roller skate. Place in motion, and then stop suddenly. Discuss what happens to the doll and why. *Light* Make a periscope using an empty milk carton and two small mirrors. *Water* a. Distill water by boiling it in a flask fitted with one-hole stopper containing a glass tube and a length of rubber tubing. Lay tubing across a tray of ice cubes and collect drops of water in container placed under end of tubing. b. Demonstrate filtration of water. Place about two inches of fine sand in a lamp chimney which has a cloth fastened across its larger end. Pour dirty water in on top of the sand. Collect water as it drips through. Notice that much of the dirt has been removed.

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[*] Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

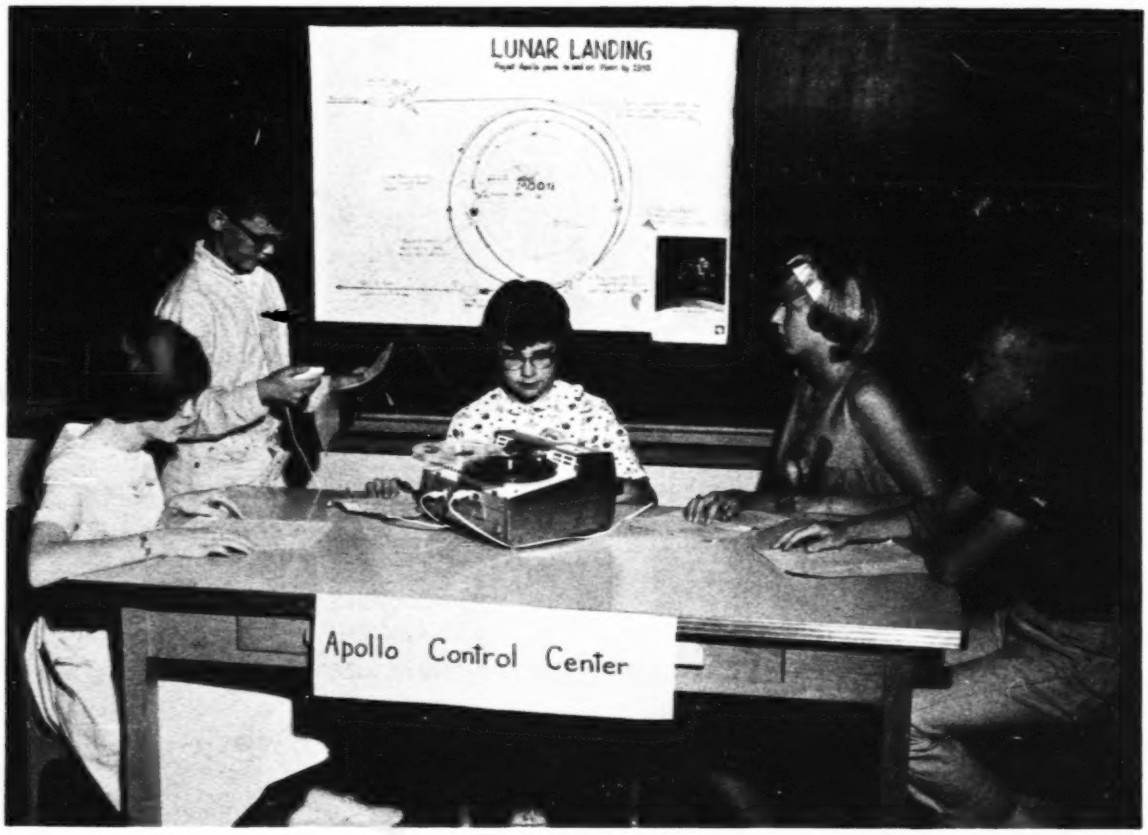
	HEALTH	*Food* Prepare a balanced meal with a blender. Put into plastic bag. Eat as astronaut would eat by squeezing bag.
All About Satellites and Space Ships ^{P}	LANGUAGE ARTS	*Written* a. Write the story of Cape Kennedy. b. Describe the launching of a satellite. c. Write an imaginary story of a trip to the moon or of exploring the moon. d. Write a history of the development of rockets and satellites. *Oral* a. Report on weather and communication satellites. b. Tell about the launching of Alan B. Shepard, Jr.
	ART	*Graphic* a. Draw pictures of space vehicles and space stations. b. Draw a mural of the history of flight. *Construction* a. Build a table-model space station. b. Build a table model of Cape Kennedy. c. Make models of imaginary space stations or space vehicles to be used as mobiles. *Sculpture* From clay, model different kinds of satellites or space stations.
	SOCIAL STUDIES	*History* Develop a time line of important events in the development of rockets and satellites. *Current Events* Keep time line up to date with news pictures and stories about satellites.
Balloons Fly High ^{P}	LANGUAGE ARTS	*Written* a. Write an "eyewitness" report of an event in ballooning. b. Write stories or poems of the history of ballooning. *Oral* a. Report on the history of ballooning. b. Report on the use of balloons to carry instruments for collecting weather data. *Drama* Dramatize episodes in the development of balloon travel.
	ART	*Graphic* Draw pictures illustrating the history of ballooning.

		Construction Make model balloons and use as mobiles.
	SCIENCE	*Air* a. Demonstrate how an object can rise in air. Float a cork on water. Press it down to bottom of container. Release. Discuss why it rises. b. Demonstrate that hot air rises. In a darkened room hold lighted candle in beam of light. Notice, in the shadow, the lines indicating the rising air.
Beyond Mars ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems of solar sailing to the planets. b. Write stories about what astronauts will find on different planets as they land. c. Write stories about pioneers colonizing a new planet. *Drama* a. Dramatize stories about interplanetary travel. b. Dramatize the story *Beyond Mars.*
Birth of a Rocket ^{T}	LANGUAGE ARTS	*Written* Write about the steps in the manufacturing and assembling of a rocket. *Oral* Report on the guidance and propulsion systems of a rocket.
Count Down: The Story of our Missile Bases ^{T}	LANGUAGE ARTS	*Oral* Report on the development of missiles.
	ART	*Construction* a. Build a model Nike missile base. b. Make models of rockets and missiles.
	SOCIAL STUDIES	*Field Trip* Visit a missile base.
Countdown: The Story of Cape Canaveral ^{P}	LANGUAGE ARTS	*Written* a. Write stories describing the launching of rockets from Cape Kennedy (formerly Cape Canaveral). b. Write the story of the building of Cape Canaveral (which now is called Cape Kennedy). *Reading* Develop a dictionary of "the language of the missilemen." *Oral* Report on the launching of Vanguard, Explorer, etc.

		Drama Dramatize the launching of a rocket.
	Art	*Graphic* Draw cartoon-type illustrations for missilemen dictionary. *Construction* Build a table model of Cape Kennedy.
	Social Studies	*Current Events* Have children bring in news pictures and stories about Cape Kennedy.
Discoverer: The Story of a Satellite ^{P}	Language Arts	*Oral* Report on the development of the Discoverer.
	Art	*Construction* Make models of the Discoverer. *Graphic* Draw pictures of the launching of the Discoverer.
Exploring by Astronauts: The Story of Project Mercury ^{P}	Language Arts	*Written* a. Write biographies of the astronauts. b. Write an "eyewitness" report of a launching of the Mercury capsule. *Oral* a. Report on the problems involved in space flight. b. Report on the methods used in tracking satellites.
	Art	*Graphic* Draw pictures of the interior or exterior of the Mercury capsule.
	Arithmetic	*Computation* Figure the specific impulse or mass ratio for different sizes of rockets.
	Social Studies	*Maps and Globes* Locate the satellite tracking stations on maps or on a globe.
The First Book of Space Travel ^{P}	Language Arts	*Written* a. Write a log of a trip into space. b. Write stories or poems about space travel. *Drama* Dramatize a trip into space. *Oral* Make a tape recording of how we feel as we travel through space.
	Art	*Graphic* Draw pictures of space traveling or of what might be seen in space.

	SCIENCE	*Light* Build a model refracting telescope using two reading glasses. *Newton's Laws* a. Demonstrate first law by showing that a small model car needs to be pushed to start it moving, and that it will keep moving until something stops it (air, friction, or other object). b. Demonstrate second law by pushing model car with varying amounts of force to show that speed of movement is related to thrust. *Centrifugal Effect* Demonstrate by placing small object on a phonograph turntable and watching it spin away. *Sound* Suspend a small bell inside a bottle fitted with one-hole stopper containing a glass tube and short piece of rubber tubing which can be clamped closed. Boil small amount of water in bottle long enough to force out all air. Close clamp. Listen for sound of bell in partial vacuum formed when bottle has cooled.
	ARITHMETIC	*Computation* Show size of solar system by figuring how long it will take to reach each planet, traveling in a craft with a speed of 2,000 miles per hour. *Measurement* Using earth's distance from the sun compare distances from the sun of other planets.
First Men to the Moon [T]	LANGUAGE ARTS	*Oral* a. Describe the launching of a moon rocket. b. Tape record a radio play about a trip to the moon (see picture 10–1). *Drama* Dramatize the story of the *First Men to the Moon.*
	ART	*Construction* a. Make a three-dimensional map of the moon. b. Make a table-model lunar vehicle or lunar base.
	SCIENCE	*Heat* Compare absorption of heat by light and dark colors. Place thermometers under each of two pieces of paper, one light and

		one dark. Place in the sun and compare temperatures.
Guide to Rockets, Missiles, and Satellites ^{P}	LANGUAGE ARTS	*Reading* Develop an aerospace dictionary. *Oral* Report about the different kinds of rockets, missiles, and satellites.



10–1.—Making a tape recording of the dramatization of a trip to the moon.

	SOCIAL STUDIES	*History* Develop a time line of the history of rocketry. *Current Events* Keep time line up to date with news pictures and stories about rocketry.
	ART	*Graphic* Draw pictures of the different kinds of rockets, missiles, and satellites. *Sculpture* Make clay models of the different kinds of rockets, missiles, and satellites.
The How and Why Wonder Book of Planets and Interplanetary Travel ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems about flights to the moon.

b. Write imaginary stories about life on other planets or about living on other planets.

c. Develop a "travel folder" for travelers to other planets.

Oral

Report on the dangers of space travel, about the solar system, or on techniques of space navigation.

ART

Graphic

a. Make a chart comparing the different planets.

b. Make a chart or bulletin board of the layers of the atmosphere.

c. Make diagrams of rocket and jet motors.

ARITHMETIC

Time

Using a stop watch, test reaction time of children.

Geometry

Draw an elliptical orbit. Place two thumbtacks about four inches apart in a cardboard. Make a loop of string around the thumbtacks. Stick a pencil into the loop; pull taut; move the pencil along, keeping the string taut.

Computation

Figure interplanetary and stellar distances in terms of light years.

SCIENCE

Light

a. Demonstrate reflection of light by the planets. Use a polished metal ball to represent the planet and a light bulb to represent the sun.

b. Show that light is composed of a spectrum. Use a prism to break up light rays.

Navigation

Demonstrate problem of hitting moving target from moving target. Have one child running in a large circular path (earth) and another running in a circular path around the first (moon). Have them attempt to play catch without pausing.

Man Alive in Outer Space [P]

LANGUAGE ARTS

Written

a. Write stories about some of our space pioneers.

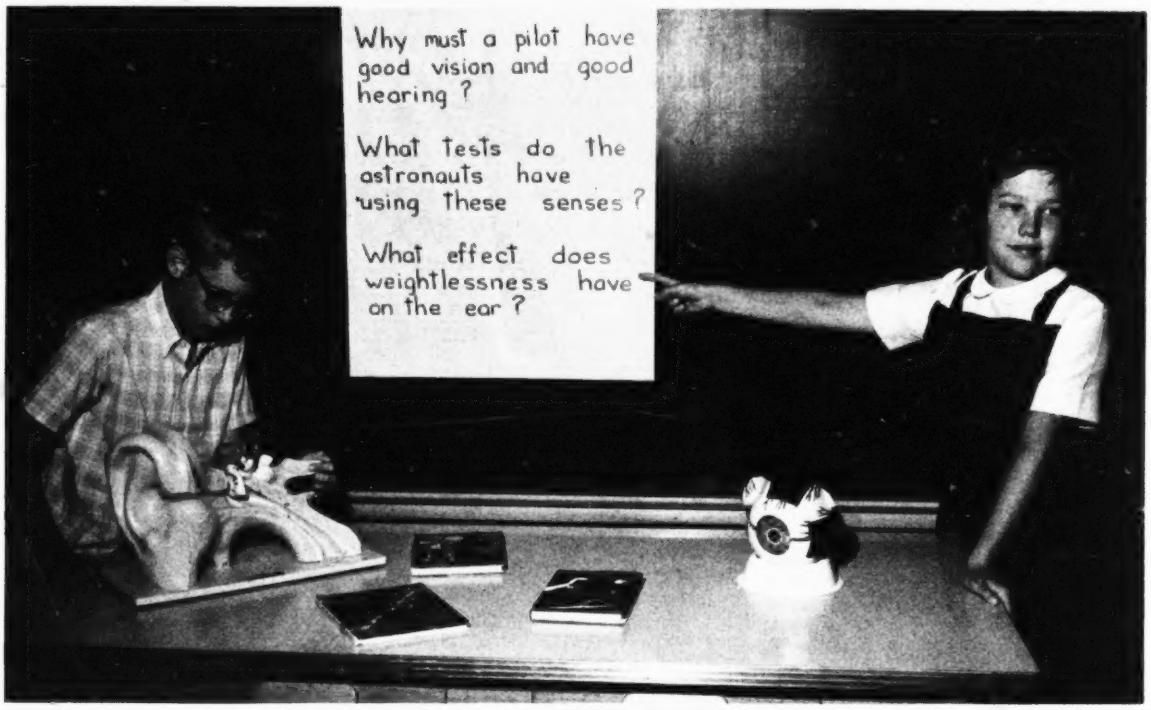
b. Write the diary of an astronaut taking tests.

Oral

a. Report about the selection of the astronauts.

b. Debate the value of sending man into space.

c. Report about the problems of keeping man alive in space: i.e., weightlessness, food, isolation, heat and cold, etc.


Why must a pilot have good vision and good hearing ?
What tests do the astronauts have using these senses ?
What effect does weightlessness have on the ear ?

10–2.—Reporting on the effect of space flight on the eyes and ears.

ART

Graphic

Draw pictures of the experiences of the astronauts preparing for space flight.

SCIENCE

Heat

Demonstrate insulation properties of various materials. Fill two small jars with water of the same temperature. Place one into a larger container. Place both in sunlight. Notice differences in temperature of water. Repeat, filling air space in large container with various materials, such as sawdust, soil, etc.

HEALTH

Eyes and Ears

Report on the effects of space flight on vision and hearing (see picture 10–2).

Heart

Report on the effects of space flight on the heart.

Off into Space ^{P}	LANGUAGE ARTS	*Written* Write stories or poems of adventures as a space traveler. *Drama* Dramatize the life of a space traveler.
	ART	*Graphic* Draw pictures of space adventures.
Robert Goddard: Space Pioneer ^{P}	LANGUAGE ARTS	*Written* Write Goddard's biography. *Oral* Report on the life of Robert Goddard. *Drama* Dramatize the life of Robert Goddard.
Rocket Aircraft, USA ^{P}	LANGUAGE ARTS	*Oral* Report on various kinds of rocket aircraft.
	ART	*Construction* Make models of the various rocket aircraft.
	SOCIAL STUDIES	*History* Make a time line of the development of rocket aircraft.
Rocket Power ^{P}	LANGUAGE ARTS	*Oral* Report on various kinds of rockets.
	ART	*Construction* a. Make models of various rockets. b. Make a bulletin board showing stages of a rocket (see picture 10–3).
	SOCIAL STUDIES	*History* a. Make a time line of the development of rocket power. b. Make a bulletin board showing stages or rocket power development.
	SCIENCE	*Action and Reaction* List as many examples as possible of everyday use of the principle of action and reaction.
Rockets into Space ^{P}	LANGUAGE ARTS	*Written* Write stories about building a space station or about living on the moon. *Drama* Dramatize a day on a space station.
	ART	*Construction* Build a model rocket or space station.
	SOCIAL STUDIES	*Current Events* a. Have children bring in pictures and stories about rockets in the news. b. Watch launching of new rockets on TV.

The Rockets' Red Glare ^{P}

LANGUAGE ARTS

Written

a. Write the story of Scott Crossfield's flights in the X–15.

b. Write the story of the launching and flight of the Mercury capsule.

THIS ROCKET HAS FOUR STAGES
Fourth Stage
First Stage
THE FIRST THREE STAGES DROP OFF QUICKLY
EARTH

10–3.—Learning about the use of staging in rockets.

c. Write stories about the future possibilities of space exploration.

Oral

a. Report about the scientists who have been associated with the development of rocketry.

b. Report on the tests the astronauts must take to qualify.

c. Report on the different methods of packaging food for space travel.

d. Debate about international control of space.

ART

Graphic

Draw pictures of the astronauts in their space suits.

MATURITY LEVEL—TEN YEARS

	SOCIAL STUDIES	*History* Make a time line showing the development of rocketry. *Current Events* Keep an up-to-date display of pictures and stories of rockets in the news.
	SCIENCE	*Gravity* a. Spin a toy gyroscope and notice its resistance to change of direction. b. Twirl around the head a ball tied to a string. Vary the length of the string and notice the varying amount of speed needed to keep it in orbit. Release string and notice direction ball travels.
	HEALTH	*Food* Pressure can, freeze, dry, and make jam of some kind of fresh fruit. Compare methods of preservation in terms of weight, flavor, appearance, etc.
Rockets to the Moon [P]	LANGUAGE ARTS	*Written* Write stories about landing on the moon or exploring the moon. *Oral* a. Report on the history of moon exploration. b. Report on the progress of the Apollo project.
	ART	*Graphic* Make a chart showing the moons of other planets. *Construction* a. Make a three-dimensional map of the moon. b. Build a table-model lunar base. c. Make clay models of real and imaginary moon rockets.
	SCIENCE	*Moon* Observe the moon through strong field glasses.
Saturn Story [P]	LANGUAGE ARTS	*Oral* a. Report on the history of the development of Saturn. b. Report on the planned uses of Saturn rockets.
	ART	*Graphic* a. Draw pictures of the Saturn rocket. b. Prepare a bulletin board showing comparison of the size of Saturn to other launch vehicles (see picture 10–4).

		Construction Make models of Saturn.
	SOCIAL STUDIES	*Current Events* Bring in news pictures and stories of Saturn.
	ARITHMETIC	*Ratio* Compare size of Saturn to known height of buildings, etc.

COMPARISON OF THE SIZE OF LAUNCH VEHICLES

10–4.—Comparing the size of space vehicles.

Space Book for Young People ^{P}	LANGUAGE ARTS	*Written* a. Collect ideas and write stories about moon myths. b. Write stories of superstitions about the sky and space.
		Oral Report on sounding rockets, satellites, or space probes.
	ART	*Graphic* a. Make a mural of our galaxy in space,

showing approximate location of our solar system.

b. Make a bulletin board of the history of rocket development showing comparative size of rockets.

c. Make diagrams showing phases of the moon.

d. Make diagrams showing eclipses of the moon and sun.

e. Draw pictures of "the man in the moon" or other figures imagined in the moon.

f. Draw "moonscapes."

Printing

Make potato or linoleum prints using symbols of planets.

ARITHMETIC

Measurements

a. Make a table of weight comparisons on different planets.

b. Make a chart showing comparative sizes and distances of planets.

Computation

a. Figure distances to planets in miles and and in light years.

b. Figure comparisons of child's weight to weight of planets.

Air

Make a bulletin board showing the layers of atmosphere.

Space in Your Future [P]

LANGUAGE ARTS

Oral

a. Report on the members of the solar system.

b. Report on the history of space exploration.

c. Report on the tools used by an astronomer.

ART

Graphic

Make a chart or bulletin board showing the layers of the atmosphere and height to which various satellites have gone.

ARITHMETIC

Computation

a. Figure sizes and distances for a model of the solar system using a suitable scale.

b. Figure height of objects using their shadow length.

c. Figure stellar distances in terms of light years.

Geometry

Draw an ellipse. Place pins about three inches apart on cardboard. Make loop of

		string. Place loop over pins. With pencil inside loop, keep string taut and draw.
	SCIENCE	*Field Trip* Visit an observatory or planetarium. *Light* a. Make a model refracting telescope using two reading glasses. b. Make a model reflecting telescope using a concave shaving mirror. c. Demonstrate movement of light waves. Place a glass dish of water on an overhead projector. Strike surface of the water with pencil. Notice how waves form. Vary force of stroke. d. Demonstrate spectrum of white light by using a prism. e. Demonstrate spectrum of white light using diffraction grating. Hold phonograph record so that strong light is reflected to the eye off record surface. f. Demonstrate parallax. Close left eye. Hold index finger about six inches in front of nose. Notice what part of wall is behind finger. Close right eye and open left. Notice what part of wall is behind finger now.
Space Monkey ^{P}	LANGUAGE ARTS	*Written* Write stories about Miss Baker's flight. *Drama* Dramatize the story of Miss Baker.
	ART	*Graphic* Draw pictures of Miss Baker's story.
	SCIENCE	*Air* Place sheet of asbestos on some source of heat. Notice that side next to heat becomes quite hot. Compare earth's atmosphere, blanketing the earth from the sun's heat, to the asbestos sheet.
Space Rockets and Missiles ^{T}	LANGUAGE ARTS	*Written* Write stories about the future possibilities in space. *Reading* Develop an aerospace vocabulary. *Oral* a. Report on the development of rockets and missiles. b. Report on the work of other countries in the area of rockets and missiles. c. Report on the development of the X–15.

		d. Report on the methods of selecting and testing astronauts.
	ART	*Graphic* Draw pictures of rockets and missiles.
	SOCIAL STUDIES	*History* Develop a time line of the history of rockets and missiles. *Current Events* Keep the time line up to date with pictures and stories of rockets and missiles in the news.
Stations in Space [P]	LANGUAGE ARTS	*Written* Write stories of life on a space station. *Oral* a. Report on the proposed types of space stations. b. Report on space stations proposed in science fiction of the past. *Reading* Develop an aerospace vocabulary.
	ART	*Graphic* Draw pictures of space stations. *Construction* Construct a table-model of a space station.
	SOCIAL STUDIES	*Current Events* Bring in news stories and pictures about space stations.
Telstar [T]	LANGUAGE ARTS	*Written* Write stories about communicating by satellite. *Drama* Dramatize the launching of Telstar. *Oral* a. Report about communication satellites. b. Debate private or government control of communication satellites.
	ART	*Graphic* Draw pictures of Telstar in orbit. *Construction* Make a model of Telstar or another communication satellite.
	SOCIAL STUDIES	*History* Develop a time line of the history of communication. *Current Events* Bring in pictures and stories about communication satellites.

What Does an Astronaut Do?^{P}	Language Arts	*Written* a. Write stories about the work of an an astronaut. b. Write the diary of a space pilot.
	Art	*Graphic* Draw pictures of space vehicles. *Construction* Build a table-model moon base.
	Social Studies	*Current Events* Have children bring in news pictures and stories about our astronauts.
Whirling Wings ^{P}	Language Arts	*Written* a. Write about the future uses of the helicopter. b. Write fictional stories of how a helicopter has been used. *Oral* a. Report on the uses of helicopters. b. Report on the development of the helicopter. c. Report on how to pilot a helicopter.
	Art	*Graphic* Draw pictures of helicopters being used for rescue work, etc.
	Social Studies	*Current Events* Bring in news stories and pictures of helicopters.

Category: Pamphlets, Brochures, and Kits

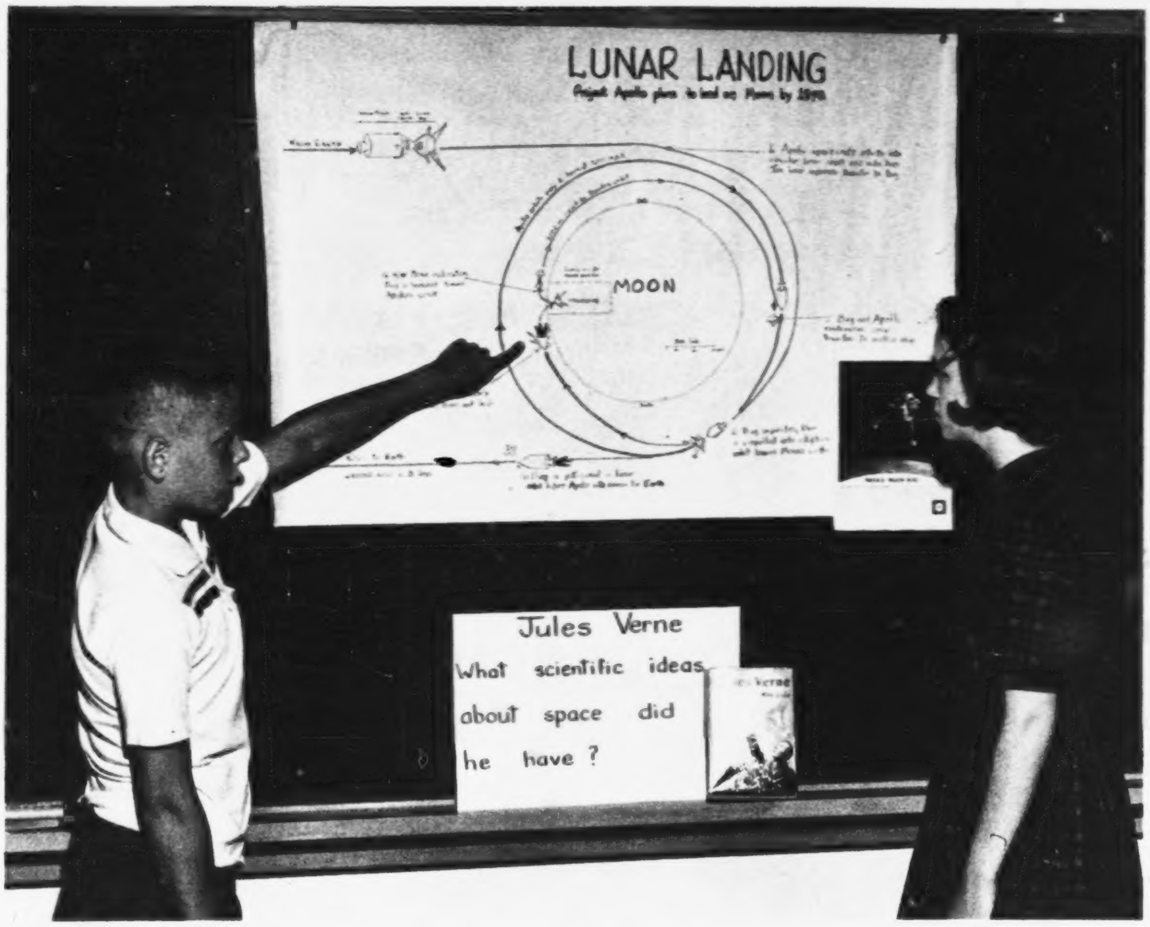
Aerojet-General Spacelines and Rocket Review ^{T}	Language Arts	*Written* Write stories or poems about the Gemini or Apollo projects. *Oral* a. Report on the Gemini or Apollo projects (see picture 10–5). b. Report on the selection and training of astronauts. c. Report on nuclear power for spacecraft.
Aerospace Mathematics ^{T}	Social Studies	*Maps and Globes* a. Change degrees of longitude to time elapsed as earth rotates. b. Change degrees of latitude to nautical miles. c. Determine the magnetic and compass headings for various flights.
	Arithmetic	*Computation* a. Determine air pressure on aircraft wing at earth's surface and at various altitudes.

b. Determine necessary altitude for flying above various objects.

c. Determine ground speed for an aircraft with various head- and tail-winds.

d. Compute the time required for a flight using various distances and ground speeds.

e. Figure fuel consumption for various length flights.


LUNAR LANDING
MOON
Jules Verne
What scientific ideas about space did he have ?

10–5.—Explaining the plan for lunar landing.

f. Figure payloads for various aircraft.

g. Find the wing loading weight for various gross weights.

h. Find amount of G weight for various G forces.

Time

Change standard time to military time and the reverse.

Scale

Convert scales of maps to distances.

Ratio

Find the aspect ratio of various aircraft wing sizes.

Aerospace Word Power ^{P}	LANGUAGE ARTS	*Reading* Develop an aerospace vocabulary.
Aircraft in Flight ^{T}	LANGUAGE ARTS	*Oral* a. Report on the forces involved in flight. b. Report on how a plane is controlled in flight. c. Report on aircraft instruments.
	SCIENCE	*Airplanes* Prepare a bulletin board showing how air flows over and around an airplane wing.
America in Space ^{P}	LANGUAGE ARTS	*Written* Write stories of the U.S. space program. *Oral* Report on the U.S. space program using pictures.
America's Space Pilots ^{P}	LANGUAGE ARTS	*Written* a. Write a letter to a favorite astronaut. b. Write stories about the lives and training of the astronauts. *Oral* Report on the lives and training of the astronauts.
	SOCIAL STUDIES	*Current Events* Bring news pictures and stories about astronauts.
Aviation Units for the Intermediate Grades ^{T}	LANGUAGE ARTS	*Written* a. After visiting the local weather bureau, write a thank-you letter. b. Write biographies of men famous in aviation's development. c. Write imaginary "current events" to fit moments in aviation history. *Oral* a. Report on history of early flying. b. Report on the different types of aircraft, their uses and history.
	SOCIAL STUDIES	*History* Make a time line of the development of aviation. *Field Trip* Visit the local airport.
	ART	*Graphic* a. Draw pictures to illustrate historical aviation events. b. Prepare a mural of the history of flight. c. Make diagrams of a jet engine. d. Make a graphic picture of the layers of the atmosphere.

e. Draw pictures of kinds of clouds. Use white and black chalk on blue paper.

Construction

a. Make models of historical planes.

b. Make a bulletin board display of kinds of clouds.

ARITHMETIC

Computation

a. Determine the total weight of air pressing on a given surface.

b. Compute flying time when flying with or against the "jet stream."

c. Convert statute miles to nautical miles and reverse.

d. Convert pounds to tons and the reverse in figuring load capacity of a cargo plane.

SCIENCE

Airplane

a. Experiment with paper model gliders or planes to simulate control of flight.

b. Obtain discarded aircraft instruments for classroom study.

c. Demonstrate action of a propeller. Place a fan on a board supported by round pencils. Observe what happens when fan is turned on.

d. Demonstrate force of combustion in gasoline engine. Place two matches in a lightly stoppered test tube. Focus sunlight on match heads by using a magnifying glass. The burst of flame will cause stopper to pop out.

Bernoulli's Principle

a. Suspend a length of paper loosely between two piles of books. Blow across the top of the paper. Notice that it rises.

b. Fasten a card to a ruler so that the card is curved. Balance ruler on pencil. Blow across the curved surface of the card.

c. Make two lightweight paper tubes. Place about one inch apart. Blow between them.

d. Suspend two sheets of paper about one inch apart between two stacks of books. Blow between them.

e. Use string to suspend two ping-pong balls about one inch apart. Through a straw, blow between the balls.

Air

Demonstrate that air has weight. Weigh a football before and after inflation.

		Weather a. Bring weather maps from the newspapers and follow changes in weather patterns. b. Visit the local weather bureau station. c. Using weather maps, attempt to forecast weather.
Breakthrough to Space [T]	LANGUAGE ARTS	*Oral* a. Report on the development of rocket power. b. Report on kinds of engines that are used in flight. c. Report on the medical problems of man in space. d. Report on the problems of re-entry.
The Cessna Aircraft Company 1911 to 1960 [T] The Cessna Story	LANGUAGE ARTS	*Oral* Report on the history of the development of the Cessna Company as an example of the development of the small civilian aircraft.
Demonstration Aids for Aviation Education [T]	SCIENCE	*Airplane* a. Demonstrate Bernoulli's principle. Suspend a ping-pong ball in the stream of air formed by a vacuum cleaner with its hose attached to the blower end. b. Make a folded paper glider and use it to demonstrate control surfaces of an airplane. *Air Pressure* a. Demonstrate that depth increases pressure. Fill a large can that has three or four holes punched in the side, one above the other, with water and notice the difference in the distances the jets of water go. b. Show that air moves from high-to low-pressure areas. Inflate a balloon fastened to one end of a piece of glass tubing. Place an empty balloon over the other end of the tubing. Notice that air pressure tends to equalize.
Earth and Space Guide for Elementary Teachers [T]	LANGUAGE ARTS	*Written* Write an "eyewitness" account of the appearance of Halley's comet. *Drama* Dramatize life on a space station.
	ART	*Graphic* Draw or paint imaginary creatures to be found on other planets.

Construction

a. Make a diorama of the solar system. Suspend balls of papier-mâché in a large cardboard box.

b. Dress doll in a model space suit.

c. Make a diorama of the Big Dipper or other familiar constellations.

ARITHMETIC

Ratio

Compare relative size of earth and sun, earth and moon, or earth and other planets.

Averages

Figure mean distance of moon from earth, or sun from earth.

Computation

Figure stellar distances in terms of light years.

Parallax

Demonstrate use of parallax to determine the distance of the planets from the sun. Hold a finger about six inches in front of the face. Look at finger first with one eye, then with the other.

SCIENCE

Solar System

a. Observe planets in the night sky. Check newspapers for listings of visible planets.

b. Demonstrate radiant heat of the sun. Use example of light bulb or a radiometer toy from toy shop.

c. Prepare a chart or diagram illustrating the causes of solar and lunar eclipses.

Light

a. Simulate twinkling of stars. Focus light source on a screen. Place source of heat near lens so that rising heat waves will cause light to flicker.

b. Shine a beam of light in a darkened room. Notice dust particles. Increase amount of particles by adding chalk dust from an eraser. Notice increased brightness as light is reflected from greater number of particles. Note that space is dark because there are no dust particles.

c. Use a prism to demonstrate that sunlight is made of a spectrum.

d. Demonstrate the differences in reflecting power of various surfaces. Include ice to show reflecting power of ice crystals in Saturn's rings.

e. Make a model refracting telescope using reading glasses.

		Gravity a. Demonstrate inertia versus gravity. Swing ball on an elastic string around head. b. Demonstrate inertia versus gravity. Push two balls off table with unequal force. Notice that the one pushed hard falls in an arc, while the other falls almost straight down. c. Demonstrate force of inertia. Catch ball with elbows rigid, then by "following through" with the motion of the ball. Notice the difference in the force of the stop.
		Centrifugal Effect Swing bucket of water overhead. Notice that water stays in bucket. Discuss why it does.
		Stars Place well-known constellations on inside of umbrella in appropriate places with North Star in center. Rotate to show circumpolar movement.
		Atmosphere a. Chart the layers of the atmosphere and their characteristics. b. Demonstrate "braking action" of air. Drag a clothespin through water, then attach a bucket (ketchup bottle cap) and notice the additional drag.
		Radio Invite a "ham" operator to class to tell about monitoring satellites.
Earth Science and Outer Space ^{P}	Language Arts	*Reading* Develop a dictionary of aerospace terms.
	Art	*Graphic* Prepare charts showing various facts about the moon: such as phases tides, and eclipses.
		Construction a. Make a bulletin board showing the relative sizes of the members of the solar system. b. Make papier-mâché models of the planets (see picture 10–6).
	Social Studies	*History* Make time line showing satellites and space probes launched.
Footprints on the Moon ^{P}	Language Arts	*Written* a. Write a story about a trip to the moon.

b. Write an "eyewitness" account of the Gemini or Apollo space trips.

Oral

a. Report on the history of lunar exploration.

b. Report on the training of the astronauts.

Planets
Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune
Pluto
ATURN
74,000 Miles
JUPITER
SUN

10–6.—Preparing models of the solar system.

c. Report on the problems of lunar exploration.

Drama

Dramatize the events in an imaginary trip to the moon.

SOCIAL STUDIES

Current Events

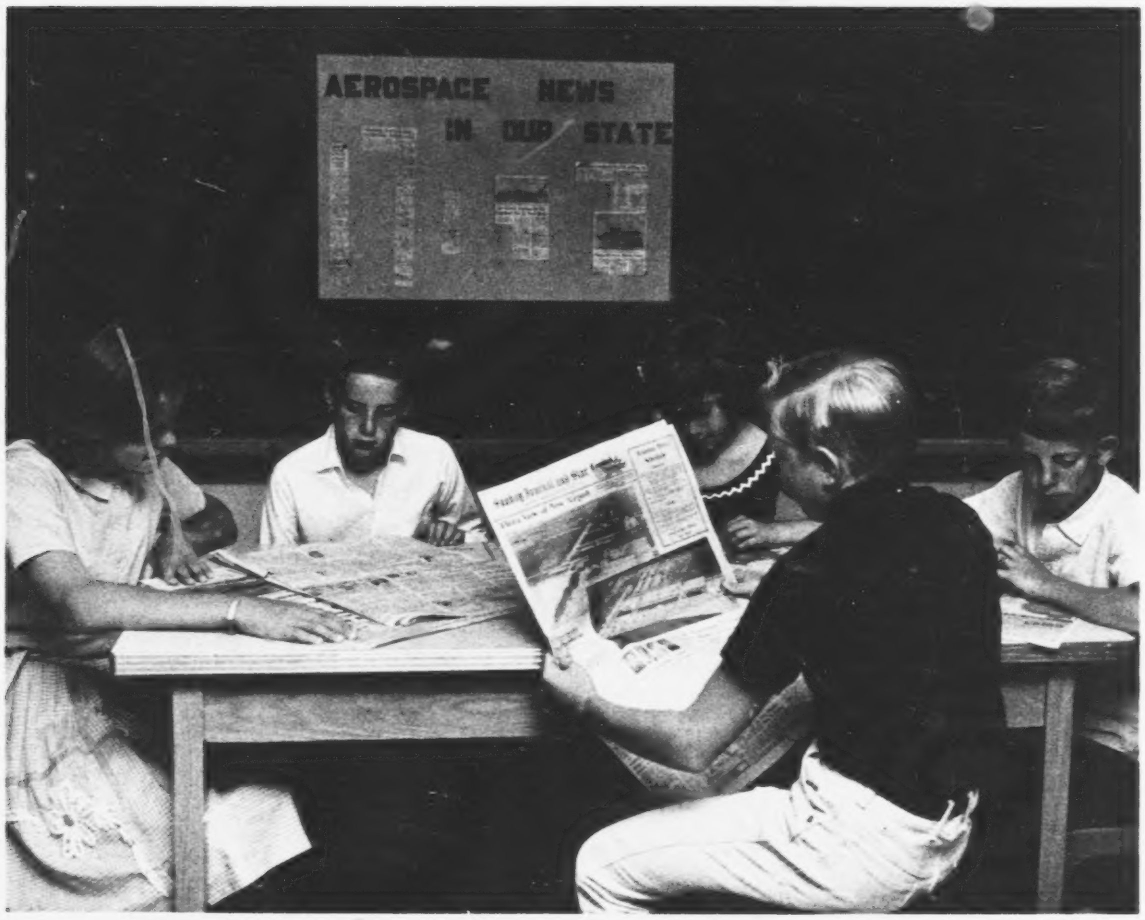
Keep an up-to-date bulletin board of events in the exploration of the moon.

	ART	*Graphic* a. Draw pictures of the surface of the moon. b. Draw pictures of a moon base. c. Draw pictures of the Gemini or Apollo spacecrafts.
Historical Highlights ^{P}	LANGUAGE ARTS	*Oral* Report on the development of The Boeing Co. as an example of an aircraft industry.
How to Forecast the Weather ^{P}	SCIENCE	*Weather* Try forecasting the weather.
	ARITHMETIC	*Graphs* Keep a line-graph record of low and high temperatures for a period of time.
Know Your Stars and Planets ^{P}	SCIENCE	*Stars* Practice recognition of stars and constellations.
The Miracle of the Helicopter ^{P}	LANGUAGE ARTS	*Oral* a. Report on the development of the helicopter. b. Report on the uses of helicopters now and in the future.
	ART	*Graphic* Draw a mural showing the use of helicopters in intra-city and inter-city transportation of passengers and material.
	SOCIAL STUDIES	*Current Events* Bring in pictures and stories of helicopters in the news.
The Mission of Man in Space ^{T}	LANGUAGE ARTS	*Written* Write stories or poems about lunar exploration. *Oral* a. Report on man's purposes in exploring space. b. Debate the origin of the solar system.
More Down-to-Earth Footnotes on the Space Age ^{P}	ART	*Graphic* Draw cartoons illustrating space age situations or problems.
National Geographic School Bulletin ^{P}	SOCIAL STUDIES	*Current Events* Report aerospace articles as news stories.
Our Orbiting Observatories ^{P}	LANGUAGE ARTS	*Oral* Report on the orbiting observatory satellites.
	SOCIAL STUDIES	*Current Events* Bring in news pictures and stories about orbiting observatories.

MATURITY LEVEL—TEN YEARS

Power for Aircraft^{T}	LANGUAGE ARTS	*Oral* a. Report on types of reciprocating engine designs. b. Report on types of propellers.
	ART	*Graphic* a. Make a diagram of an internal combustion engine. b. Make diagrams showing the four-stroke engine.
	SCIENCE	*Airplane* a. Demonstrate jet propulsion by using a rotating water sprinkler. b. Demonstrate the action of the reciprocating engine by comparing it to the movements involved in riding a bicycle. *Friction* Compare the reduction of friction. Rub two pieces of metal together without any lubricant, with oil as a lubricant, with rollers or balls to reduce friction.
Rockets and Space Vehicles^{P}	LANGUAGE ARTS	*Oral* a. Report on the scientists associated with the development of space vehicles. b. Report on spacecraft subsystems: propulsion, navigation, biotechnical, etc. c. Report on the different kinds of spacecraft. d. Report on nuclear-powered space vehicles.
Skylights^{P}	LANGUAGE ARTS	*Written* Write stories using current events as the plot.
	SOCIAL STUDIES	*Current Events* Report current events concerning aerospace (see picture 10–7).
Smithsonian Institution Information Leaflets^{P}	LANGUAGE ARTS	*Written* a. Write biographies of men important in the history of flight. b. Write stories based upon events in the lives of men important in the history of flight. *Drama* a. Dramatize the events in the lives of men important in the history of flight. b. Prepare an "eyewitness" radio program concerning important events in aviation.
Space—Challenge and Promise^{P}	LANGUAGE ARTS	*Written* Write about the possibilities of future space travel.

		Oral Report on the benefits of space research.
	ART	*Graphic* Draw pictures of present and future space vehicles. *Construction* Build models of present and future space vehicles.



10–7.—Searching the newspaper for aerospace news.

Space Talk P	LANGUAGE ARTS	*Written* Use dictionary to help write space stories. *Drama* Use dictionary to help dramatize space stories.
Space Travel P	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms. *Written* a. Describe flying in a spacecraft. b. Report on the history and purpose of weather satellites, communication satellites, navigation satellites, etc.

		c. Describe the methods used to get into space and back. *Oral* a. Report on the projected Apollo trip to the moon. b. Report on proposed trips to Mars and Venus. c. Report on the history and purpose of sounding rockets, lunar spacecraft, interplanetary probes, and planetary probes. d. Report on the development of manned spacecraft and space stations. e. Report on spacecraft launch operations. f. Explain how a satellite orbits the earth. g. Report on the problems of space flight.
	ARITHMETIC	*Size* Prepare a chart or bulletin board showing the comparative sizes of the launch vehicles or of manned spacecraft. *Scale* Prepare a chart or bulletin board showing vast distances in space.
	SOCIAL STUDIES	*History* a. Develop a time line of the satellites or space probes that have been launched. b. Prepare a time line of the "conquest of space."
Strategic Air Command ^{P}	LANGUAGE ARTS	*Oral* Report on the B–52 and SAC (see picture 10–8).
The Triumph of Astronaut L. Gordon Cooper, Jr., and the Faith 7 ^{P}	LANGUAGE ARTS	*Written* Write the story of Cooper's flight. *Oral* Report on Cooper's flight.
	SCIENCE	*Heat* Compare the amount of heat absorbed. Place thermometer in each of two cans, one painted dull black, the other shiny metal. Take readings of the thermometers after cans have been in the sun for a while.
	SOCIAL STUDIES	*History* Make a time line showing the chronology of the Mercury project tests. *Maps and Globes* a. Locate tracking stations on map or globe. b. Trace with colored thread the orbit of Cooper's flight.

A World in Space [T]	LANGUAGE ARTS	*Oral* Report on the useful things that have resulted from space research.

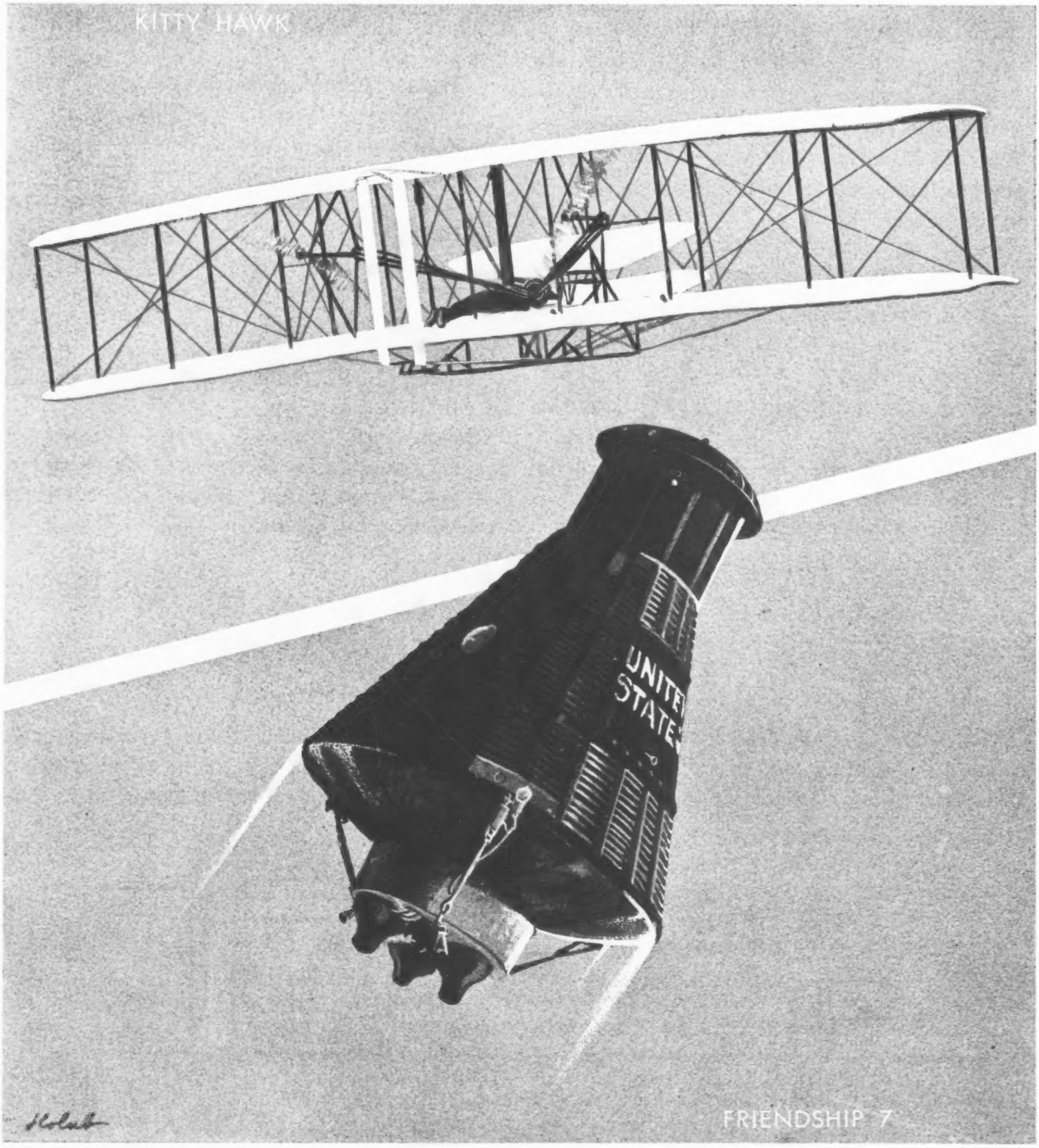
PLANES FROM
LN OVE
Some Strategic Air Command planes fly across the Atlantic, have aerial refueling over Spain and return to the U.S.
Why is SAC so important ?
SAC

10–8.—Learning about SAC and its importance.

Category: Models

History of Flight Display: Drawings, Directions

FLIGHT—THEN AND NOW


KITTY HAWK
UNITED STATES
Holub
FRIENDSHIP 7

TEN YEARS

Models and Materials

This panorama will depict the progress of flight from Kitty Hawk to the Atlas-Mercury project. There are many different types or aircraft that might be used to show how flight has changed. The following list represents a partial listing of the plastic models available for use in this panorama.

Wright Brothers Kitty Hawk—Monogram Models Inc., Kit PA30, $.98
First powered, man-carrying airplane

Ford Tri-motor—Monogram Models Inc., Kit PA15, $.98
First all-metal plane and first commercial transport

Spirit of St. Louis—Hawk Model Corp., Kit 608, $.50
Charles Lindberg's plane

Piper Cub—Monogram Models Inc., Kit G1, $1.00
Popular light plane for many years

707 Astrojet—Revell Inc., H–243, $1.29
America's first commercial passenger jet

X–15—Revell Inc., Kit H–164, $.98
Manned rocket plane, flight at edge of space

Redstone Booster–Mercury Capsule—Revell Inc., Kit H–1832, $.98
First U.S. manned satellite

Friendship 7—Revell Inc., Kit H–1833, $2.49
Replica of John Glenn's craft

The only other special materials needed would be:

Boxes—Preferably at least 12 inches square. As many boxes are needed as there are plastic models in the panorama. Materials to cover the boxes.

Construction

As a teacher considers the construction of the panorama depicting the progression of flight from Kitty Hawk to the Atlas-Mercury project, she may find that it will not be practical to include all the plastic flight models listed in the preceding paragraph. Any combination of aircraft that starts with Kitty Hawk and ends with the Friendship 7 would successfully indicate the idea of evolution in the vehicles of flight.

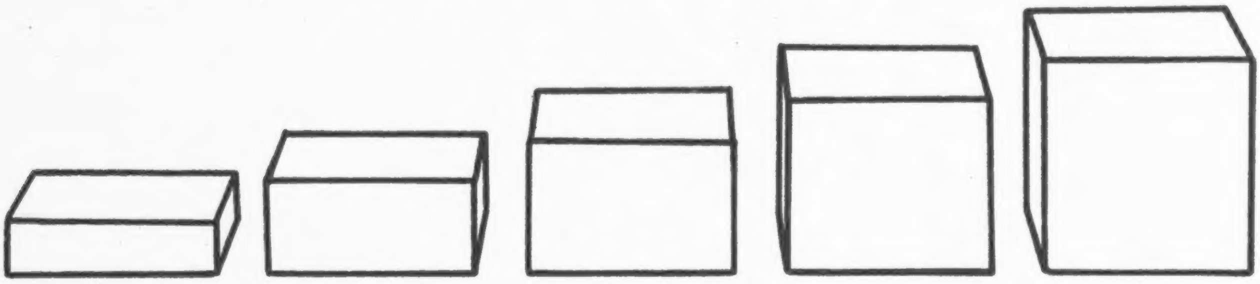


Fig.—10–a.

The first step in the construction of the base for this panorama is to take the boxes and cut them off at varying heights so they present a stairstep effect. A suggested progression might be to start at 3 inches and make each successive box 2 inches higher. It would be well to choose boxes that when inverted present a smooth platform. See figure 10–a.

The second step in the preparation of the base would be to have students cover or decorate the boxes. Methods could range from having students cover the boxes with crepe paper or white construction paper that could be colored or painted, to more extensive projects such as depiction of the terrain by use of papier-mâché or a salt-and-flour mixture.

The last step is to find an appropriate place in the room to set up the display. The exact placement will depend on the limitations of room and facilities. If table or counter space is available, the display could probably best be exhibited in this fashion. If it is not practical to use table or counter space, perhaps it would be possible to set the display on the floor next to a wall.

SECTION 7

Maturity Level—Eleven Years[*]

INSTRUCTIONAL MATERIALS	CURRENT AREAS	ACTIVITIES
Category: Books		
Alive in Space [P]	LANGUAGE ARTS	*Written* Write stories about the experimentation being done to solve problems of space travel. *Oral* a. Report on the problems to be solved before space travel is feasible. b. Report on the selection and training of astronauts.
	SCIENCE	*Inertia* Place a doll in sitting position in a box mounted on a roller skate. Place in motion and then stop suddenly. Discuss what happens to the doll and why. *Light* Make a periscope using an empty milk carton and two small mirrors. *Water* a. Distill water by boiling it in a flask fitted with one-hole stopper containing a glass tube and a length of rubber tubing. Lay tubing across a tray of ice cubes and collect drops of water in container placed under end of tubing. b. Demonstrate filtration of water. Place about two inches of fine sand in a lamp chimney which has cloth fastened across its larger end. Pour dirty water in on top of the sand. Collect water as it drips through. Notice that much of the dirt has been removed.

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[*] Indicates suggested maturity level, not chronological age.

[P] Material suggested for teacher and pupil use.

[T] Material suggested for teacher use primarily.

	HEALTH	*Food* Prepare a balanced meal with a blender. Put into plastic bag. Eat as astronaut would eat by squeezing bag.
All About Satellites and Space Ships [P]	LANGUAGE ARTS	*Written* a. Write the story of Cape Kennedy. b. Describe the launching of a satellite. c. Write an imaginary story of a trip to the moon or of exploring the moon. d. Write a history of the development of rockets and satellites. *Oral* a. Report on weather and communication satellites. b. Tell about the launching of Alan B. Shepard, Jr.
	ART	*Graphic* a. Draw pictures of space vehicles and space stations. b. Draw a mural of the history of flight. *Construction* a. Build a table-model space station. b. Build a table model of Cape Kennedy. c. Make models of imaginary space stations or space vehicles to be used as mobiles. *Sculpture* From clay, model different kinds of satellites or space stations.
	SOCIAL STUDIES	*History* Develop a time line of important events in the history of rockets and satellites. *Current Events* Keep time line up to date with news pictures and stories about satellites.
Balloons Fly High [P]	LANGUAGE ARTS	*Written* a. Write an "eyewitness" report of an event in ballooning. b. Write stories or poems of the history of ballooning. *Oral* a. Report on the history of ballooning. b. Report on the use of balloons to carry instruments for collecting weather data. *Drama* Dramatize episodes in the development of balloon travel.
	ART	*Graphic* Draw pictures illustrating the history of ballooning.

		Construction Make model balloons and use as mobiles.
	SCIENCE	*Air* a. Demonstrate how an object can rise in air. Float a cork on water. Press it down to bottom of container. Release. Discuss why it rises. b. Demonstrate that hot air rises. In a darkened room hold lighted candle in a beam of light. Notice, in the shadow, the lines indicating the rising air.
Beyond Mars ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems of solar sailing to the planets. b. Write stories about what astronauts will find on different planets as they land. c. Write stories about pioneers colonizing a new planet. *Drama* a. Dramatize stories about interplanetary travel. b. Dramatize the story *Beyond Mars*.
Birth of a Rocket ^{P}	LANGUAGE ARTS	*Written* Write about the steps in the manufacturing and assembling of a rocket. *Oral* Report on the guidance and propulsion systems of a rocket.
Countdown: The Story of Our Missile Bases ^{P}	LANGUAGE ARTS	*Oral* Report on the development of missiles.
	ART	*Construction* a. Build a model Nike missile base. b. Make models of rockets and missiles. *Field Trip* Visit a missile base.
Countdown: The Story of Cape Canaveral ^{P}	LANGUAGE ARTS	*Written* a. Write stories describing the launching of rockets from the Cape. b. Write the story of the building of Cape Canaveral (now called Cape Kennedy). *Reading* Develop a dictionary of "the language of the missilemen." *Oral* Report on the launching of Vanguard, Explorer, etc. *Drama* Dramatize the launching of a rocket.

	ART	*Graphic* Draw cartoon-type illustrations for missilemen dictionary. *Construction* Build a table model of Cape Kennedy.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about Cape Kennedy.
Discoverer: The Story of a Satellite ^{P}	LANGUAGE ARTS	*Oral* Report on the development of the Discoverer.
	ART	*Graphic* Draw pictures of the launching of the Discoverer. *Construction* Make models of the Discoverer.
Exploring byAs tronaut: The Story of Project Mercury ^{P}	LANGUAGE ARTS	*Written* a. Write biographies of the astronauts. b. Write an "eyewitness" report of a launching of the Mercury capsule. *Oral* a. Report on the problems involved in space flight. b. Report on the methods used in tracking satellites.
	ART	*Graphic* Draw pictures of the interior or exterior of the Mercury capsule.
	ARITHMETIC	*Computation* Figure the specific impulse or mass ratio for different sizes of rockets.
	SOCIAL STUDIES	*Maps and Globes* Locate the satellite tracking stations on maps or on a globe.
The First Book of Space Travel ^{P}	LANGUAGE ARTS	*Written* a. Write a log of a trip into space. b. Write stories or poems about space travel. *Drama* Dramatize a trip into space. *Oral* Make a tape recording of how we feel as we travel through space.
	ART	*Graphic* Draw pictures of space traveling or of what might be seen in space.
	SCIENCE	*Light* Build a model refracting telescope using two reading glasses.

		Newton's Laws a. Demonstrate first law by showing that a small model car needs to be pushed to start it moving, and that it will keep moving until something stops it (air, friction, or other object). b. Demonstrate second law by pushing model car with varying amounts of force to show that speed of movement is related to thrust. *Sound* Suspend a small bell inside a bottle fitted with one-hole stopper containing a glass tube and short piece of rubber tubing which can be clamped closed. Boil small amount of water in bottle long enough to force out all air. Close clamp. Listen for sound of bell in partial vacuum formed when bottle has cooled. *Centrifugal Effect* Demonstrate by placing small object on a phonograph turntable and watching it spin away.
	ARITHMETIC	*Computation* Show size of solar system by figuring how long it will take to reach each planet, traveling in a craft with a speed of 2000 miles per hour. *Measurement* Using earth's distance from the sun, compare distances from the sun of other planets.
First Men to the Moon ^{P}	LANGUAGE ARTS	*Written* Write the story of an imaginary trip to explore the moon (see picture 11–1). *Oral* a. Tape record a radio play about a trip to the moon. b. Describe the launching of a moon rocket. *Drama* Dramatize the story of the *First Men to the Moon.*
	ART	*Construction* a. Make a three-dimensional map of the moon. b. Make a table-model lunar vehicle or lunar base.
	SCIENCE	*Heat* Compare absorption of heat by light and dark colors. Place thermometers under each of two pieces of paper, one light and

3

		one dark. Place in the sun and compare temperatures.
Guide to Rockets, Missiles, and Satellites ^{P}	LANGUAGE ARTS	*Reading* Develop an aerospace dictionary. *Oral* Report about the different kinds of rockets, missiles, and satellites.

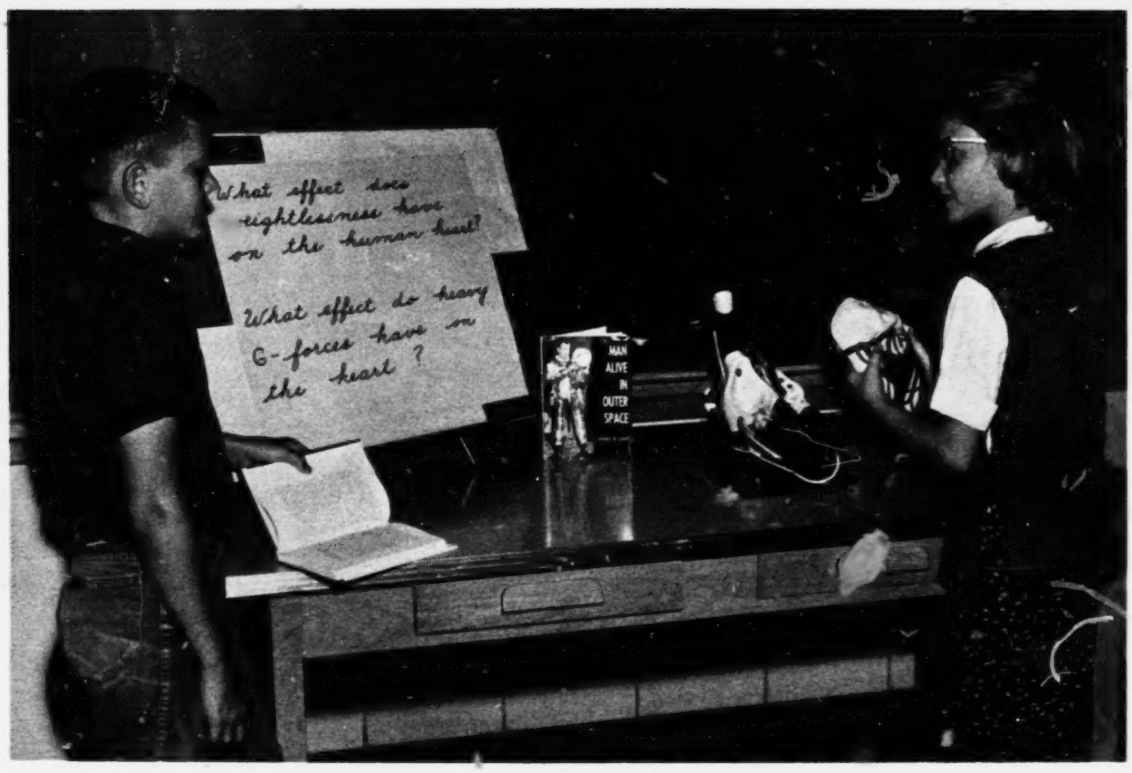
SPACE PROBES PROGRAM
NASA
SPACE
LET'S EXPLORE
THE MOON

11-1.—Gathering information for writing a story about a trip to the moon.

	SOCIAL STUDIES	*History* Develop a time line of the history of rocketry. *Current Events* Keep time line up to date with news pictures and stories about rocketry.
	ART	*Graphic* Draw pictures of the different kinds of rockets, missiles, and satellites. *Sculpture* Make clay models of the different kinds of rockets, missiles, and satellites.
The How and Why Wonder Book of Planets and Interplanetary Travel ^{P}	LANGUAGE ARTS	*Written* a. Write stories or poems about flights to the moon. b. Write imaginary stories about life on other planets or about living on other planets.

		c. Develop a "travel folder" for travelers to other planets. *Oral* Report on the dangers of space travel, about the solar system, or on techniques of space navigation.
	ART	*Graphic* a. Make a chart comparing the different planets. b. Make a chart or bulletin board of the layers of the atmosphere. c. Make diagrams of rocket and jet motors.
	ARITHMETIC	*Time* Using a stop watch, test reaction time of children. *Geometry* Draw an elliptical orbit. Place two thumbtacks about four inches apart in a cardboard. Make a loop of string around the thumbtacks. Stick a pencil into the loop; pull taut; move the pencil along, keeping the string taut. *Computation* Figure interplanetary and stellar distances in terms of light years.
	SCIENCE	*Light* a. Demonstrate reflection of light by the planets. Use a polished metal ball to represent the planet and a light bulb to represent the sun. b. Show that light is composed of a spectrum. Use a prism to break up light rays. *Navigation* Demonstrate problem of hitting moving target from moving target. Have one child running in a large circular path (earth) and another running in a circular path around the first (moon). Have them attempt to play catch without pausing.
Man Alive in Outer Space [P]	LANGUAGE ARTS	*Written* a. Write stories about some of our space pioneers. b. Write the diary of an astronaut taking tests. *Oral* a. Report about the selection of the astronauts. b. Debate the value of sending man into space.

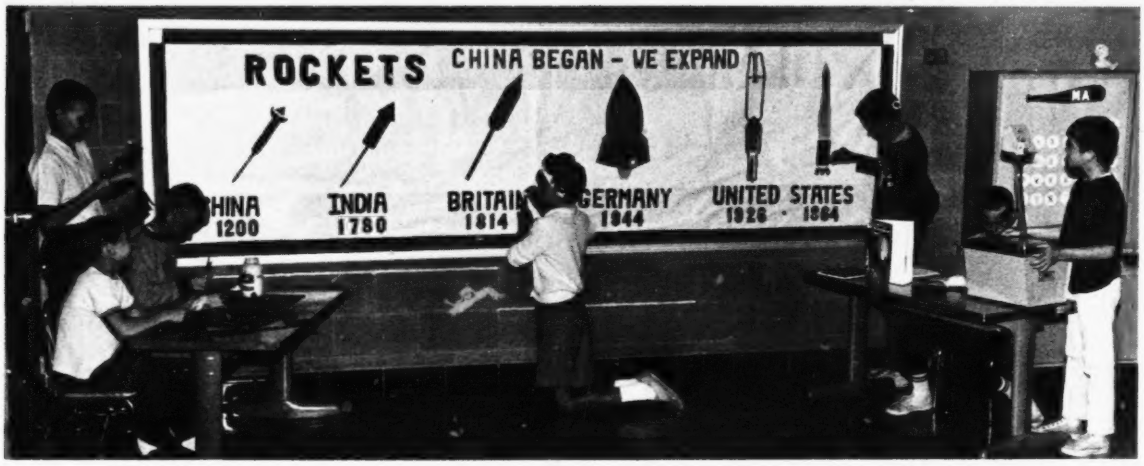
		c. Report about the problems of keeping man alive in space: i.e., weightlessness, food, isolation, heat and cold, etc.
	ART	*Graphic* Draw pictures of the experiences of the astronauts preparing for space flight.


What effect does
eightlessness have
on the human heart?
What effect do heavy
G-forces have on
the heart ?
MAN
ALIVE
IN
OUTER
SPACE

11-2—Finding out about the effects of space flight on the heart.

	SCIENCE	*Heat* Demonstrate insulation properties of various materials. Fill two small jars with water of the same temperature. Place one into a larger container. Place both in sunlight. Notice differences in temperature of water. Repeat, filling air space in larger container with various materials, such as sawdust, soil, etc.
	HEALTH	*Eyes and Ears* Report on the effects of space flight on vision and hearing. *Heart* Report on the effects of space flight on the heart (see picture 11-2).
Off into Space P	LANGUAGE ARTS	*Written* Write stories or poems of adventures as a space traveler.

		Drama Dramatize the life of a space traveler.
	ART	*Graphic* Draw pictures of space adventures.
Robert Goddard: Space Pioneer ^{P}	LANGUAGE ARTS	*Written* Write Goddard's biography. *Oral* Report on the life of Robert Goddard. *Drama* Dramatize the life of Robert Goddard.



11-3.—Charting the history of rocketry.

Rocket Aircraft, USA ^{P}	LANGUAGE ARTS	*Oral* Report on various kinds of rocket aircraft.
	ART	*Construction* Make models of the various rocket aircraft.
	SOCIAL STUDIES	*History* Make a time line of the development of rocket aircraft.
Rocket Power ^{P}	LANGUAGE ARTS	*Oral* Report on various kinds of rockets.
	ART	*Construction* Make models of various rockets.
	SOCIAL STUDIES	*History* a. Make a time line of the development of rocket power. b. Make a bulletin board showing stages of rocket power development (see picture 11-3).
	SCIENCE	*Action and Reaction* List as many examples as possible of everyday use of the principle of action and reaction.

Rockets into Space [P]	LANGUAGE ARTS	*Written* Write stories about building a space station or about living on the moon. *Drama* Dramatize a day on a space station.
	ART	*Construction* Build a model rocket or space station.
	SOCIAL STUDIES	*Current Events* a. Have children bring in pictures and stories about rockets in the news. b. Watch launchings of new rockets on TV (see picture 11–4).

11–4.—Observing TV coverage of a rocket launching.

The Rockets' Red Glare [P]	LANGUAGE ARTS	*Written* a. Write the story of Scott Crossfield's flights in the X–15. b. Write the story of the launching and flight of the Mercury capsule. c. Write stories about the future possibilities of space exploration. *Oral* a. Report about the scientists who have been associated with the development of rocketry. b. Report on the tests the astronauts must take to qualify. c. Report on the different methods of packaging food for space travel. d. Debate about international control of space.

	ART	*Graphic* Draw pictures of the astronauts in their space suits.
	SOCIAL STUDIES	*History* Make a time line showing the development of rocketry. *Current Events* Keep an up-to-date display of pictures and stories of rockets in the news.
	SCIENCE	*Gravity* a. Spin a toy gyroscope and notice its resistance to change of direction. b. Twirl around the head a ball tied to a string. Vary the length of the string and notice the varying amount of speed needed to keep it in orbit. Release string and notice direction ball travels.
	HEALTH	*Food* Pressure can, freeze, dry, and make jam of some kind of fresh fruit. Compare methods of preservation in terms of weight, flavor, appearance, etc.
Rockets to the Moon ^{P}	LANGUAGE ARTS	*Written* Write stories about landing on the moon or exploring the moon. *Oral* a. Report on the history of moon exploration. b. Report on the progress of the Apollo project.
	ART	*Graphic* Make a chart showing the moons of other planets. *Construction* a. Make a three-dimensional map of the moon. b. Build a table-model lunar base. c. Make clay models of real and imaginary moon rockets.
	SCIENCE	*Moon* Observe the moon through strong field glasses.
Saturn Story ^{P}	LANGUAGE ARTS	*Oral* a. Report on the history of the development of Saturn. b. Report on the planned uses of Saturn rockets.
	ART	*Graphic* a. Draw pictures of the Saturn rocket.

b. Prepare chart or bulletin board showing comparison of size of Saturn to other launch vehicles.

Construction

Make models of Saturn.

SOCIAL STUDIES

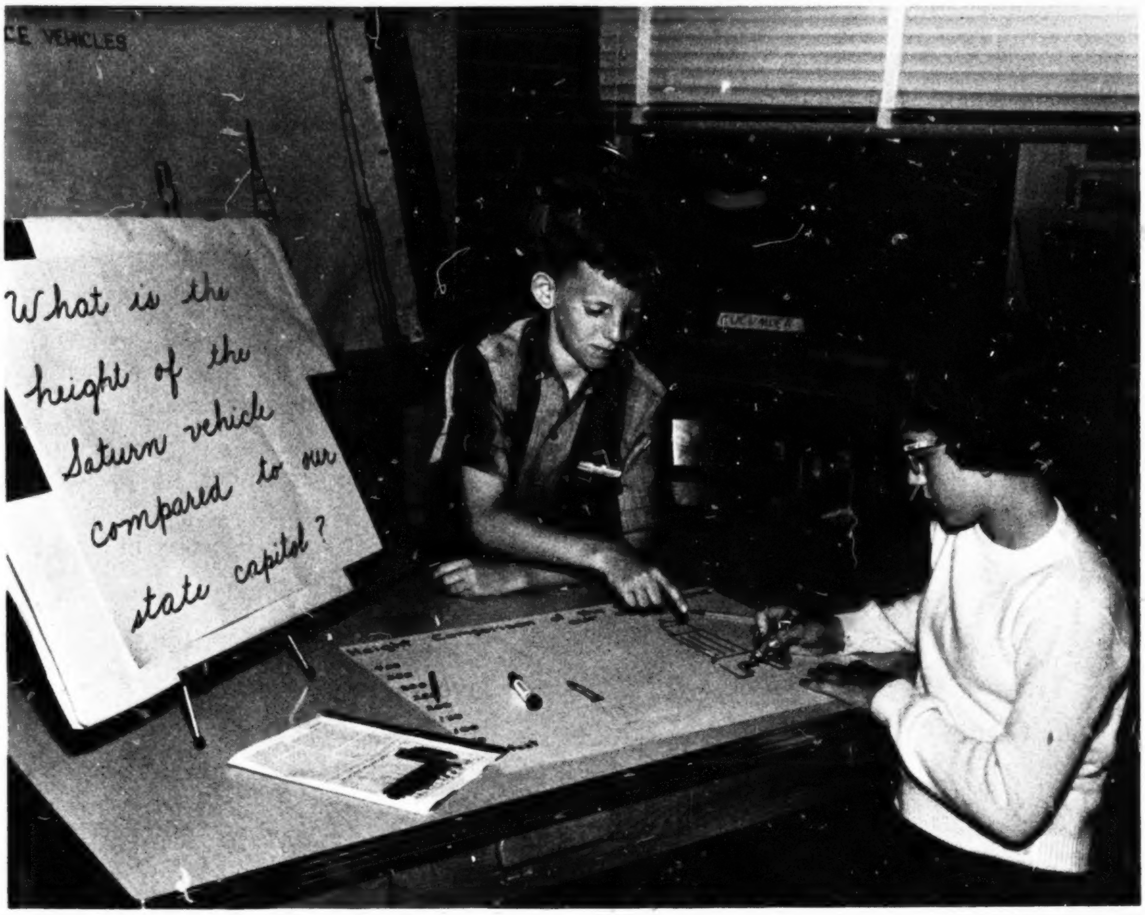
Current Events

Bring in news pictures and stories of Saturn.

ARITHMETIC

Ratio

Compare size of Saturn to known height of buildings, etc. (see picture 11–5).


CE VEHICLES
What is the height of the Saturn vehicle compared to our state capitol?

11–5.—Comparing the size of space vehicles to known local buildings.

Space Book for Young People [P]

LANGUAGE ARTS

Written

a. Collect ideas and write stories about moon myths.

b. Write stories of superstitions about the sky and space.

Oral

Report on sounding rockets, satellites, or space probes.

ART

Graphic

a. Make a mural of our galaxy in space,

		showing approximate location of our solar system. b. Make a bulletin board of the history of rocket development showing comparative size of rockets. c. Make diagrams showing phases of the moon. d. Make diagrams showing eclipses of the moon and sun. e. Draw pictures of "the man in the moon" or other figures imagined in the moon. f. Draw "moonscapes." *Printing* Make potato or linoleum prints using symbols of planets.
	ARITHMETIC	*Measurements* a. Make a table of weight comparisons on different planets. b. Make a chart showing comparative sizes and distances of planets. *Graphs* Make a circle graph showing proportional components of air. *Computation* a. Figure distances to planets in miles and in light years. b. Figure comparisons of child's weight to weight of planets.
	SCIENCE	*Air* Make a bulletin board showing the layers of the atmosphere.
Space in Your Future [P]	LANGUAGE ARTS	*Oral* a. Report on the members of the solar system. b. Report on the history of space exploration. c. Report on the tools used by an astronomer.
	ART	*Graphic* Make a chart or bulletin board showing the layers of the atmosphere and height to which various satellites have gone.
	ARITHMETIC	*Computation* a. Figure sizes and distances for a model of the solar system using a suitable scale. b. Figure height of objects using their shadow length. c. Figure stellar distances in terms of light years.

		Geometry Draw an ellipse. Place pins about three inches apart in cardboard. Make loop of string. Place loop over pins. With pencil inside loop, keep string taut and draw.
	SCIENCE	*Field Trip* Visit an observatory or planetarium. *Light* a. Make a model refracting telescope using two reading glasses. b. Make a model reflecting telescope using a concave shaving mirror. c. Demonstrate movement of light waves. Place a glass dish of water on an overhead projector. Strike surface of the water with a pencil. Notice how waves form. Vary force of stroke. d. Demonstrate spectrum of white light by using a prism. e. Demonstrate spectrum of white light using diffraction grating. Hold phonograph record so that strong light is reflected to the eye off record surface. f. Demonstrate parallax. Close left eye. Hold index finger about six inches in front of nose. Notice what part of wall is behind finger. Close right eye and open left. Notice what part of wall is behind finger now.
Space Monkey [P]	LANGUAGE ARTS	*Written* Write stories about Miss Baker's flight. *Drama* Dramatize the story of Miss Baker.
	ART	*Graphic* Draw pictures of Miss Baker's story.
	SCIENCE	*Air* Place sheet of asbestos on some source of heat. Notice that side next to heat becomes quite hot, but side away from heat does not. Compare earth's atmosphere, blanketing the earth from the sun's heat, to the asbestos sheet.
Space Rockets and Missiles [P]	LANGUAGE ARTS	*Written* Write stories about the future possibilities in space. *Reading* Develop an aerospace vocabulary. *Oral* a. Report on the development of rockets and missiles.

		b. Report on the work of other countries in the area of rockets and missiles. c. Report on the development of the X–15. d. Report on the methods of selecting and testing astronauts.
	ART	*Graphic* Draw pictures of rockets and missiles.
	SOCIAL STUDIES	*History* Develop a time line of the history of rockets and missiles. *Current Events* Keep the time line up to date with pictures and stories of rockets and missiles in the news.
Spacecraft ^{P}	LANGUAGE ARTS	*Written* a. Write about the benefits of space exploration. b. Write about the history of space flight. c. Write a description of a manned lunar trip. *Oral* a. Report on the different kinds of spacecraft. b. Report on launch vehicles, space stations, the Ranger program, or the Surveyor program. c. Report on the problems involved in exploration of space.
	SCIENCE	*Gravity* a. Fasten strong string to small ball. Holding the string 12 inches from the ball, twirl the ball in a circle. Count the number of orbits per minute. Repeat, holding the string 24, 36, and 48 inches from the ball. b. Make a plywood disk to fit a phonograph turntable. Secure a three-inch dowel in the center. Through a hole in the top of the dowel put a string and attach balls of unequal weight to either end of the string. Spin turntable at different speeds and attempt to balance balls. c. Make a plywood disk to fit a phonograph turntable. Secure a three-inch dowel at the outer edge. Hang a small ball from the top of the post. Spin turntable at different speeds and notice action of ball.

MATURITY LEVEL—ELEVEN YEARS

Stations in Space [P]	LANGUAGE ARTS	*Written* Write stories of life on a space station. *Oral* a. Report on the proposed types of space stations. b. Report on space stations proposed in science fiction of the past. *Reading* Develop an aerospace vocabulary.
	ART	*Graphic* Draw pictures of space stations. *Construction* Construct a table model of a space station.
	SOCIAL STUDIES	*Current Events* Bring in news stories and pictures about space stations.
Telstar [P]	LANGUAGE ARTS	*Written* Write stories about communicating by satellite. *Drama* Dramatize the launching of Telstar. *Oral* a. Report about communication satellites. b. Debate private or government control of communication satellites.
	ART	*Graphic* Draw pictures of Telstar in orbit. *Construction* Make a model of Telstar or another communication satellite.
	SOCIAL STUDIES	*History* Develop a time line of the history of communication. *Current Events* Bring in pictures and stories about communication satellites.
What Does an Astronaut Do? [P]	LANGUAGE ARTS	*Written* a. Write stories about the work of an astronaut. b. Write the diary of a space pilot.
	ART	*Graphic* Draw pictures of space vehicles. *Construction* Build a table-model moon base.
	SOCIAL STUDIES	*Current Events* Have children bring in news pictures and stories about our astronauts.
Whirling Wings [P]	LANGUAGE ARTS	*Written* a. Write about the future uses of the helicopter.

		b. Write fictional stories of how a helicopter has been used. *Oral* a. Report on the uses of helicopters. b. Report on the development of the helicopter. c. Report on how to pilot a helicopter.
	ART	*Graphic* Draw pictures of helicopters being used for rescue work, etc.
	SOCIAL STUDIES	*Current Events* Bring news stories and pictures of helicopters.

Category: Pamphlets, Brochures, and Kits

Aerojet-General Spacelines and Rocket Review ^{P}	LANGUAGE ARTS	*Written* Write stories or poems about the Gemini or Apollo projects. *Oral* a. Report on the Gemini or Apollo projects. b. Report on the selection and training of astronauts. c. Report on nuclear power for spacecraft.
Aerospace Mathematics ^{T}	SOCIAL STUDIES	*Maps and Globes* a. Change degrees of longitude to time elapsed as earth rotates. b. Change degrees of latitude to nautical miles. c. Determine the magnetic and compass headings for various flights.
	ARITHMETIC	*Computation* a. Determine air pressure on aircraft wing at earth's surface and at various altitudes. b. Determine necessary altitude for flying above various objects. c. Determine air temperature at various altitudes. d. Determine ground speed for an aircraft with various head- and tail-winds. e. Figure fuel consumption for various length flights. f. Figure payloads for various aircraft. g. Find the wing loading weight for various gross weights. h. Find amount of G weight for various G forces.

		i. Compute the time required for a flight using various distances and ground speeds. j. Convert temperatures from centigrade to Fahrenheit and the reverse. k. Determine true airspeed for an aircraft at various altitudes.
	Art	*Construction* Prepare a bulletin board showing use of arithmetic in space (see picture 11–6). *Time* Change standard time to military time and the reverse. *Scale* Convert scales of maps to distances. *Ratio* Find the aspect ratio of various aircraft wing sizes. *Percent* Determine what percent of air is nitrogen at 20,000 ft., at 35,000 ft. *Measurement* a. Convert statute miles to nautical miles and the reverse. b. Change light years to parsecs and the reverse.
Aerospace Word Power [P]	Language Arts	*Reading* Develop an aerospace vocabulary.
Aircraft in Flight [P]	Language Arts	*Oral* a. Report on the forces involved in flight. b. Report on how a plane is controlled in flight. c. Report on aircraft instruments.
	Science	*Airplanes* Prepare a bulletin board showing how air flows over and around an airplane wing.
America in Space [P]	Language Arts	*Written* Write stories of the U.S. space program. *Oral* Report on the U.S. space program using pictures.
America's Space Pilots [P]	Language Arts	*Written* a. Write a letter to a favorite astronaut. b. Write stories about the lives and training of the astronauts. *Oral* Report on the lives and training of the astronauts.

SOCIAL STUDIES

Current Events

Bring news stories and pictures about astronauts.

Aviation Units for the Intermediate Grades T

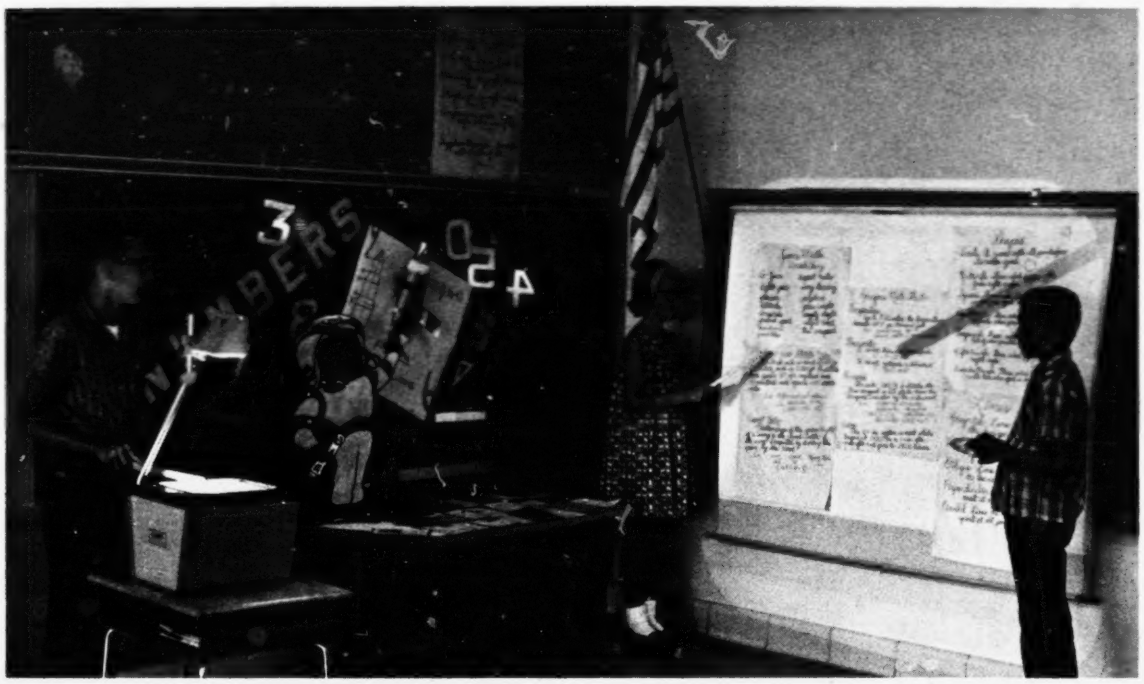
LANGUAGE ARTS

Written

a. After visiting the local weather bureau, write a thank-you letter.

b. Write biographies of men famous in aviation's development.

c. Write imaginary "current events" to fit moments in aviation history.



11-6.—Learning about spare mathematics.

Oral

a. Report on history of early flying (see picture 11-7).

b. Report on the different types of aircraft, their uses and history.

SOCIAL STUDIES

History

Make a time line of the development of aviation.

ART

Graphic

a. Draw pictures to illustrate historical aviation events.

b. Prepare a mural of the history of flight (see picture 11-8).

c. Make diagrams of a jet engine.

d. Make a graphic picture of the layers of the atmosphere.

e. Draw pictures of kinds of clouds. Use white and black chalk on blue paper.

Construction

a. Make models of historical planes.

b. Make a bulletin board display of kinds of clouds (see picture 11–9).

ARITHMETIC

Computation

a. Determine the total weight of air pressing on a given surface.

How long has man wanted to fly?
What were the first attempts man made to fly?
How have aviation ideas developed?
What started our recent
What do these satellites space probes and unmanned spacecraft tell us about space?
What are the purposes of the manned space projects?
What are some of the
space?
Leonardo Da Vinci's Inventions
Flying Machine
Air Screw or Helicopter

11–7.—Reporting on early ideas about flight.

b. Compute flying time when flying with or against the "jet stream."

c. Convert statute miles to nautical miles and the reverse.

d. Convert pounds to tons and the reverse in figuring load capacity of a cargo plane (see picture 11–10).

SCIENCE

Airplane

a. Experiment with paper model gliders or planes to simulate control of flight.

b. Obtain discarded aircraft instruments for classrooom study.

c. Demonstrate action of a propeller. Place a fan on a board supported by round pencils. Observe what happens when fan is turned on.

d. Demonstrate force of combustion in gasoline engine. Place two matches in a lightly stoppered test tube. Focus sunlight on match heads by using a magnifying glass. The burst of flame will cause stopper to pop out.

11-8.—Studying in front of a mural depicting the history of aviation.

Bernoulli's Principle

a. Suspend a length of paper loosely between two piles of books. Blow across the top of paper. Notice that it rises.

b. Fasten a card to a ruler so that the card is curved. Balance ruler on pencil. Blow across the curved surface of the card.

c. Make two lightweight paper tubes. Place about one inch apart. Blow between them.

d. Suspend two sheets of paper about one inch apart between two stacks of books. Blow between them.

e. Use string to suspend two ping-pong balls about one inch apart. Through a straw, blow between the balls.

Air

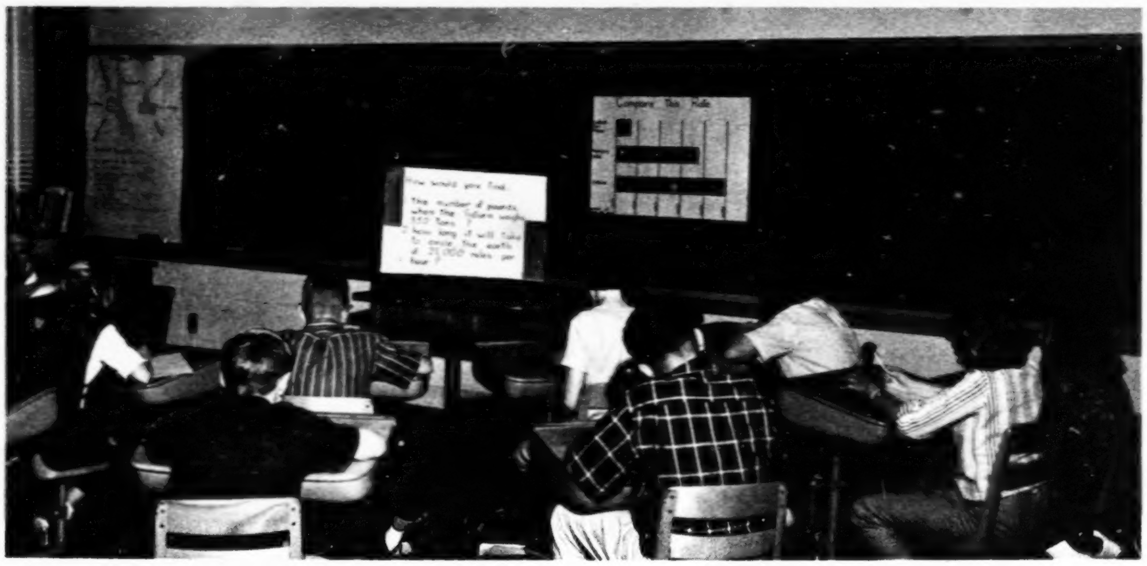
Demonstrate air has weight. Weigh a football before and after inflation.

		Weather a. Bring weather maps from the newspapers and follow changes in weather patterns. b. Visit the local weather bureau station. c. Using weather maps, attempt to forecast weather.

11–9.—Studying weather and weather instruments.

Breakthrough to Space ^{T}	LANGUAGE ARTS	*Oral* a. Report on the development of rocket power. b. Report on kinds of engines that are used in flight. c. Report on the medical problems of man in space. d. Report on the problem of re-entry.
Career Brief ^{P}	LANGUAGE ARTS	*Written* Write about imaginary incidents in the life of person employed in some phase of aviation. *Oral* Report on the training needed and the opportunities available for a career in aviation.
Career Opportunities with the Airlines ^{P}	LANGUAGE ARTS	*Written* Write an imaginary autobiography of an airline employee.

		Oral Report on the careers open in the airlines.
Certain Men Wanted ^{P}	LANGUAGE ARTS	*Oral* Report on careers in aircraft industries.
The Cessna Aircraft Company 1911 to 1960 The Cessna Story ^{T}	LANGUAGE ARTS	*Oral* Report on the history of the development of the Cessna company as an example of the development of the small civilian aircraft.



11–10.—Using aerospace concepts in mathematics.

Demonstration Aids for Aviation Education ^{T}	SCIENCE	*Airplane* a. Demonstrate Bernoulli's principle. Suspend a ping-pong ball in the stream of air formed by a vacuum cleaner with its hose attached to the blower end. b. Make a folded paper glider and use it to demonstrate control surfaces of an airplane. *Air Pressure* a. Demonstrate that depth increases pressure. Fill a large can that has three or four holes punched in the side, one above the other, with water and notice the difference in the distances the jets of water go. b. Show that air moves from the high- to low-pressure areas. Inflate a balloon fastened to one end of a piece of glass tubing. Place an empty balloon over the other end of the tubing. Notice that air pressure tends to equalize.

		Cosmic Rays Make a Wilson Cloud chamber (p. 30) in order to observe the paths of cosmic rays.
Earth and Space Guide for Elementary Teachers [T]	LANGUAGE ARTS	*Written* Write an "eyewitness" account of the appearance of Halley's comet. *Drama* Dramatize life on a space station.
	ART	*Graphic* Draw or paint imaginary creatures to be found on other planets. *Construction* a. Make a diorama of the solar system. Suspend balls of papier-mâché in a large cardboard box. b. Dress doll in a model space suit. c. Make a diorama of the Big Dipper or other familiar constellations.
	ARITHMETIC	*Ratio* Compare relative size of earth and sun, earth and moon, or earth and other planets. *Averages* Figure mean distance of moon from earth, or sun from earth. *Computation* Figure stellar distances in terms of light years. *Parallax* Demonstrate use of parallax to determine the distance of the planets from the sun. Hold a finger about six inches in front of the face. Look at finger first with one eye, then with the other.
	SCIENCE	*Solar System* a. Observe planets in the night sky. Check newspapers for listings of visible planets. b. Demonstrate radiant heat of the sun. Use example of light bulb or a radiometer toy from toy shop. c. Prepare a chart or diagram illustrating the causes of solar and lunar eclipses. *Light* a. Simulate twinkling of stars. Focus light source on a screen. Place source of heat near lens so that rising heat waves will cause light to flicker.

b. Shine a beam of light in a darkened room. Notice dust particles. Increase amount of particles by adding chalk dust from an eraser. Notice increased brightness as light is reflected from greater number of particles. Note that space is dark because there are no dust particles.

c. Use a prism to demonstrate that sunlight is made of a spectrum.

d. Demonstrate the differences in reflecting power of various surfaces. Include ice to show reflecting power of ice crystals in Saturn's rings.

e. Make a model refracting telescope using reading glasses.

Gravity

a. Demonstrate inertia versus gravity. Swing ball on an elastic string around head.

b. Demonstrate inertia versus gravity. Push two balls off table with unequal force. Notice that the one pushed hard falls in an arc, while the other falls almost straight down.

c. Demonstrate force of inertia. Catch ball with elbows rigid, then by "following through" with the motion of the ball. Notice the difference in the force of the stop.

Centrifugal Effect

Swing bucket of water overhead. Notice that water stays in bucket. Discuss why it does.

Stars

Place well-known constellations on inside of umbrella in appropriate places with North Star in center. Rotate to show circumpolar movement.

Atmosphere

a. Chart the layers of the atmosphere and their characteristics.

b. Demonstrate "braking action" of air. Drag clothespin through water, then attach a bucket (ketchup bottle cap) and notice the additional drag.

Radio

Invite a "ham" operator to class to tell about monitoring satellites.

Cosmic Rays

Compare the glowing of the aurora to the glowing of the neon light.

MATURITY LEVEL—ELEVEN YEARS

Earth Science and Outer Space ^{P}	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms.
	ART	*Graphic* Prepare charts showing various facts about the moon: such as, phases, tides, and eclipses. *Construction* a. Make a bulletin board showing the relative sizes of the members of the solar system. b. Make papier-mâché models of the planets.
	SOCIAL STUDIES	*History* Make time line showing satellites and space probes launched.
Footprints on the Moon ^{P}	LANGUAGE ARTS	*Written* a. Write a story about a trip to the moon. b. Write an "eyewitness" account of a Gemini or Apollo space trip. *Oral* a. Report on the history of lunar exploration. b. Report on the training of the astronauts. c. Report on the problems of lunar exploration. *Drama* Dramatize the events in an imaginary trip to the moon.
	SOCIAL STUDIES	*Current Events* Keep an up-to-date bulletin board of events in the exploration of the moon.
	ART	*Graphic* a. Draw pictures of the surface of the moon. b. Draw pictures of a moon base. c. Draw pictures of the Gemini or Apollo spacecraft.
For Earth Orbiters . . . Your Astroguide Navigator ^{T}	ARITHMETIC	*Time* a. Find Greenwich time for various local times. b. Compute sidereal time for various locations.
	SOCIAL STUDIES	*Maps and Globes* Use the astroguide to locate geographic positions.
Gravity ^{T}	LANGUAGE ARTS	*Written* Write an imaginary story about a space flight made possible by an anti-gravity device.

	Science	*Gravity* a. Compare speeds of object rolling down an inclined plane using different angles of inclination. b. Compare the speed of fall of two objects of identical size and shape, but different weights.
Historical Highlights [P]	Language Arts	*Oral* Report on history of the development of The Boeing Co. as an example of an aircraft industry.
How a Typical Liquid-Propellant, Pump-Fed Rocket Engine Works [P]	Art	*Graphic* Draw a diagram of a three-stage rocket showing the parts of the motors.
How to Forecast the Weather [P]	Science	*Weather* Try forecasting the weather.
	Arithmetic	*Graphs* Keep a line-graph record of low and high temperatures for a period of time.
Introduction of Aerospace [P]	Language Arts	*Oral* a. Report on the effect of aerospace progress on our daily lives. b. Report on the aerospace manufacturing and transport industries. c. Report on aerospace careers available.
Jennies to Jets [P]	Language Arts	*Oral* Report on the development of the Federal Aviation Agency.
Know Your Stars and Planets [P]	Science	*Stars* Practice recognition of stars and constellations.
The Miracle of the Helicopter [P]	Language Arts	*Oral* a. Report on the development of the helicopter. b. Report on the uses of helicopters now and in the future.
	Art	*Graphic* Draw a mural showing the use of helicopters in intra-city and inter-city transportation of passengers and material.
	Social Studies	*Current Events* Bring in pictures and stories of helicopters in the news.
The Mission of Man in Space [T]	Language Arts	*Written* Write stories or poems about lunar exploration.

		Oral a. Report on man's purposes in exploring space. b. Debate the origin of the solar system.
More Down-to-Earth Footnotes on the Space Age [P]	ART	*Graphic* Draw cartoons illustrating space-age situations or problems.
NASA Facts [P]	LANGUAGE ARTS	*Written* Write the story of the development of satellites. *Oral* Report on the satellites
	ART	*Graphic* Draw pictures of satellites.
National Geographic School Bulletin [P]	SOCIAL STUDIES	*Current Events* Report aerospace articles as news stories.
Our Orbiting Observatories [P]	LANGUAGE ARTS	*Oral* Report on the orbiting observatory satellites.
	SOCIAL STUDIES	*Current Events* Bring in news pictures and stories about orbiting observatories.
Power for Aircraft [T]	LANGUAGE ARTS	*Oral* a. Report on types of reciprocating engine designs. b. Report on types of propellers. c. Report on carburetion and ignition systems.
	ART	*Graphic* a. Make a diagram of an internal combustion engine. b. Make diagrams showing the four-stroke engine.
	SCIENCE	*Airplane* a. Demonstrate jet propulsion by using a rotating water sprinkler. b. Demonstrate the action of the reciprocating engine by comparing it to the movements involved in riding a bicycle. *Friction* Compare the reduction of friction. Rub two pieces of metal together without any lubricant, with oil as a lubricant, with rollers or balls to reduce friction.
The Problems of Aerospace Power [T]	LANGUAGE ARTS	*Oral* a. Report on the aerospace industry and research in aerospace. b. Report on the development of airline transportation.

c. Report on the development of civilian airport facilities and their problems.

d. Report on methods of interplanetary navigation.

Debate

Debate the question of control of space.

STERN EUROPE

11–11.—Debating the wisdom of spending so much money on space research.

Projects: Space [P]

LANGUAGE ARTS

Written

a. Describe the launching of a satellite.

b. Write about the "rewards" of space research.

Oral

a. Report on the developments in air and space travel.

b. Report on the development of NASA and its purposes.

c. Report on proposed space projects.

d. Report on the different types of power being developed for space travel.

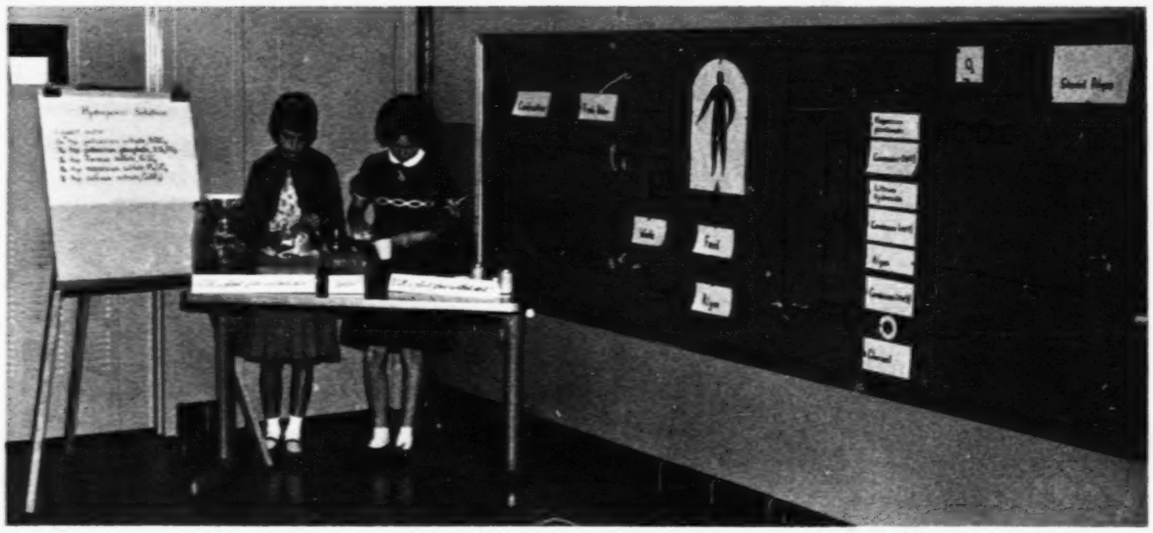
e. Report on the satellite tracking methods used.

f. Report on the research being carried on in both life sciences and physical sciences.

g. Report on the problems of international cooperation in space research.

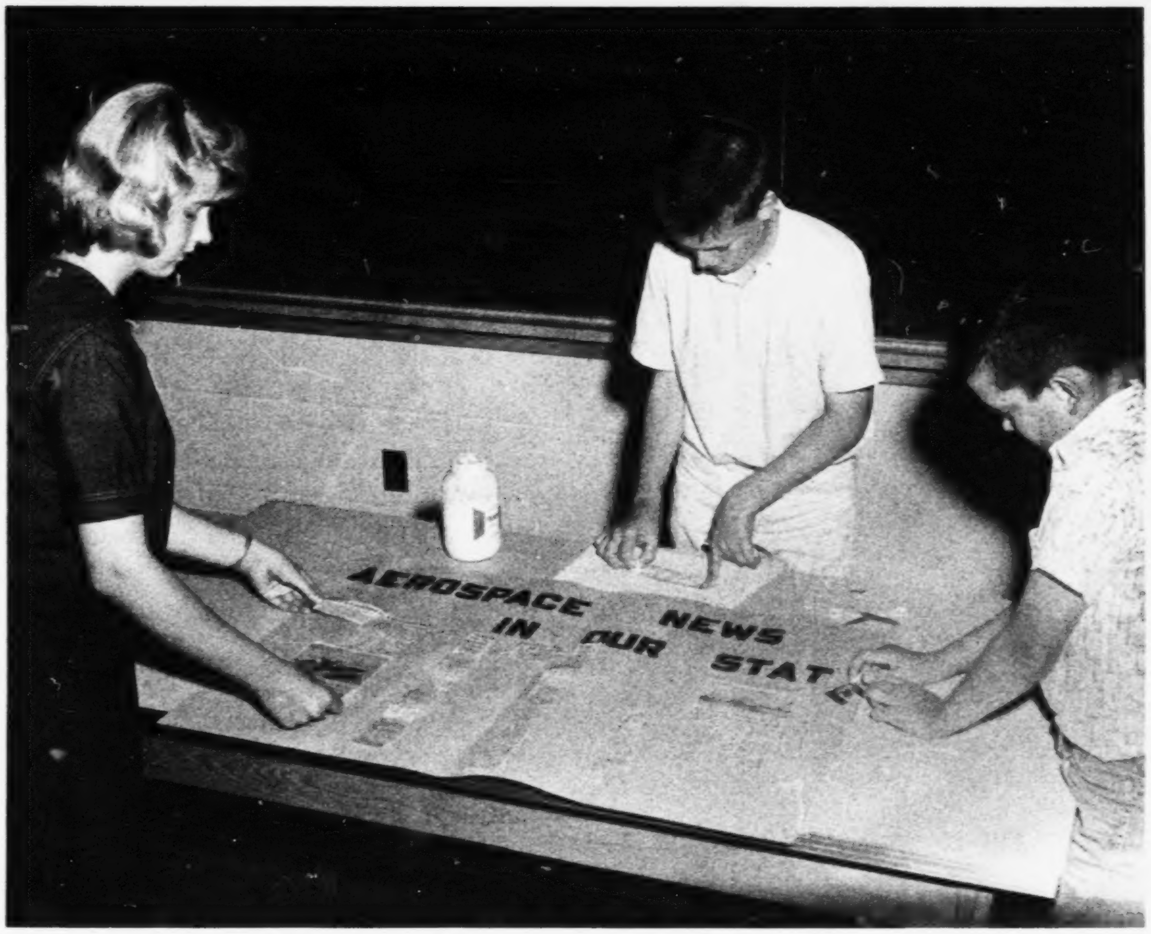
h. Debate question of spending money on more space research or on "war on poverty" (see picture 11–11).

		Reading Develop an aerospace dictionary.
	SOCIAL STUDIES	*Maps and Globes* Locate tracking stations on a map or globe.
Rockets and Space Vehicles P	LANGUAGE ARTS	*Oral* a. Report on the scientists associated with the development of space vehicles. b. Report on spacecraft subsystems: propulsion, navigation, biotechnical, etc. c. Report on the different kinds of spacecraft. d. Report on nuclear-powered space vehicles.
	ART	*Graphic* Prepare a bulletin board showing life-support systems of a space station (see picture 11–12).
The Search for Extraterrestrial Life T	LANGUAGE ARTS	*Oral* Report on methods used or proposed for detection of life in space.
Skylights P	LANGUAGE ARTS	*Written* Write stories using current events as the plot.
	SOCIAL STUDIES	*Current Events* Report current events concerning aerospace (see picture 11–13).
Smithsonian Institution Information Leaflets P	LANGUAGE ARTS	*Written* a. Write biographies of men important in the history of flight.



11–12.—Learning about life-support systems for spacecraft.

		b. Write stories based upon events in the lives of men important in the history of flight. *Drama* a. Dramatize the events in the lives of men important in the history of flight. b. Prepare an "eyewitness" radio program concerning important events in aviation.
Space—Challenge and Promise ^{P}	LANGUAGE ARTS	*Written* Write about the possibilities of future space travel. *Oral* Report on the benefits of space research.
	ART	*Graphic* Draw pictures of present and future space vehicles. *Construction* Build models of present and future space vehicles.



11-13.—Preparing a display of aerospace current events.

Space Research^{P}

LANGUAGE ARTS

Oral

a. Report on how space research is changing our lives.

b. Debate whether U.S. should spend more money on space research (see picture 11–14).

Against
For

11–14.—Debating whether the United States should spend more on space research

Space Science^{T}

LANGUAGE ARTS

Written

a. Compare space science development in the USA and USSR.

b. Write about the possibilities of life on other planets.

Oral

a. Report on the history of space travel.

b. Report on the Atlas and Saturn launch vehicles.

c. Report on the types of rockets proposed for future space travel.

d. Report on the Apollo, Ranger, and Surveyor projects.

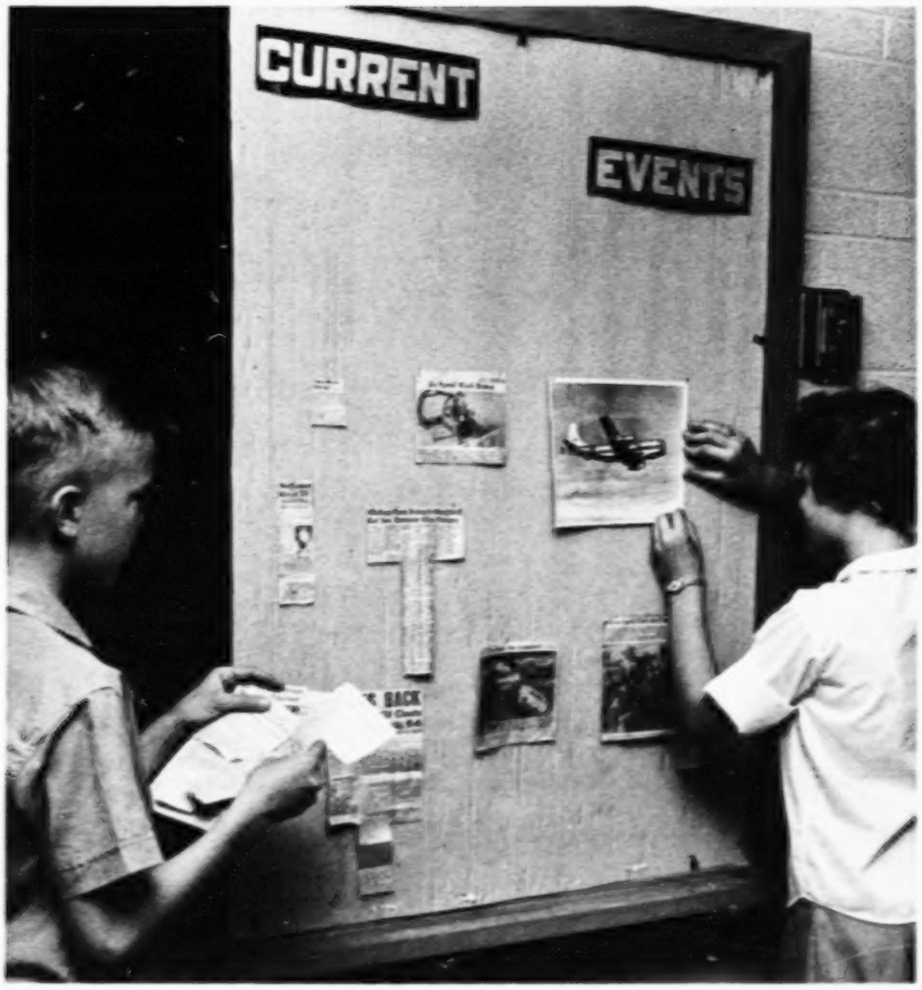
e. Report on the possible uses of satellites.

SOCIAL STUDIES

Current Events

Keep an up-to-date bulletin board of space science news (see picture 11–15).

Space Talk^{P}	LANGUAGE ARTS	*Written* Use dictionary to help write space stories. *Drama* Use dictionary to help dramatize space stories.

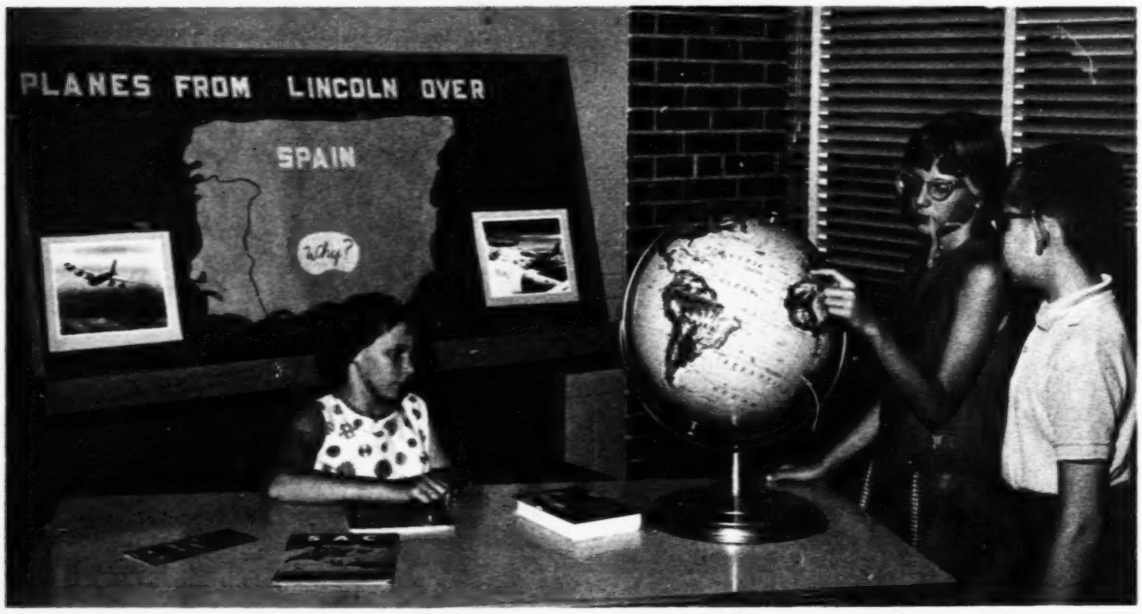


11–15.—Preparing a current events bulletin board.

Space Travel^{P}	LANGUAGE ARTS	*Reading* Develop a dictionary of aerospace terms. *Written* a. Describe flying in a spacecraft. b. Report on the history and purpose of weather satellites, communication satellites, navigation satellites, etc. c. Describe the methods used to get into space and back. *Oral* a. Report on the projected Apollo trip to the moon.

		b. Report on proposed trips to Mars and Venus. c. Report on the history and purpose of sounding rockets, lunar spacecraft, interplanetary probes, and planetary probes. d. Report on the development of manned spacecraft and space stations. e. Report on spacecraft launch operations. f. Explain how a satellite orbits the earth. g. Report on the problems of space flight. h. Report on career possibilities in the aerospace industries.
	ARITHMETIC	*Size* Prepare a chart or bulletin board showing the comparative sizes of the launch vehicles or of manned spacecraft. *Scale* Prepare a chart or bulletin board showing vast distances in space.
	SOCIAL STUDIES	*History* a. Develop a time line of the satellites or space probes that have been launched. b. Prepare a time line of the "conquest of space."
Strategic Air Command [P]	LANGUAGE ARTS	*Oral* a. Report on the B–52. b. Report on the flight plan for training B–52 pilots (see picture 11–16).
The Triumph of Astronaut L. Gordon Cooper, Jr., and the Faith 7 [P]	LANGUAGE ARTS	*Written* Write the story of Cooper's flight. *Oral* Report on Cooper's flight.
	SCIENCE	*Heat* Compare the amount of heat absorbed. Place thermometer in each of two cans, one painted dull black, the other shiny metal. Take readings of the thermometers after cans have been in the sun for a while.
	SOCIAL STUDIES	*History* Make a time line showing the chronology of the Mercury project tests. *Maps and Globes* a. Locate tracking stations on map or globe. b. Trace with colored thread the orbit of Cooper's flight.

A World in Space ^{T}	LANGUAGE ARTS	*Oral* a. Report on the useful things that have resulted from space research. b. Report on the uses of space research by the geophysist and astronomer. c. Report on the possibilities of life in space. d. Report on the meaning to the "average man" of space research findings and possibilities.
Your Wings Are Showing ^{P}	LANGUAGE ARTS	*Oral* Report on the requirements for becoming a private pilot.

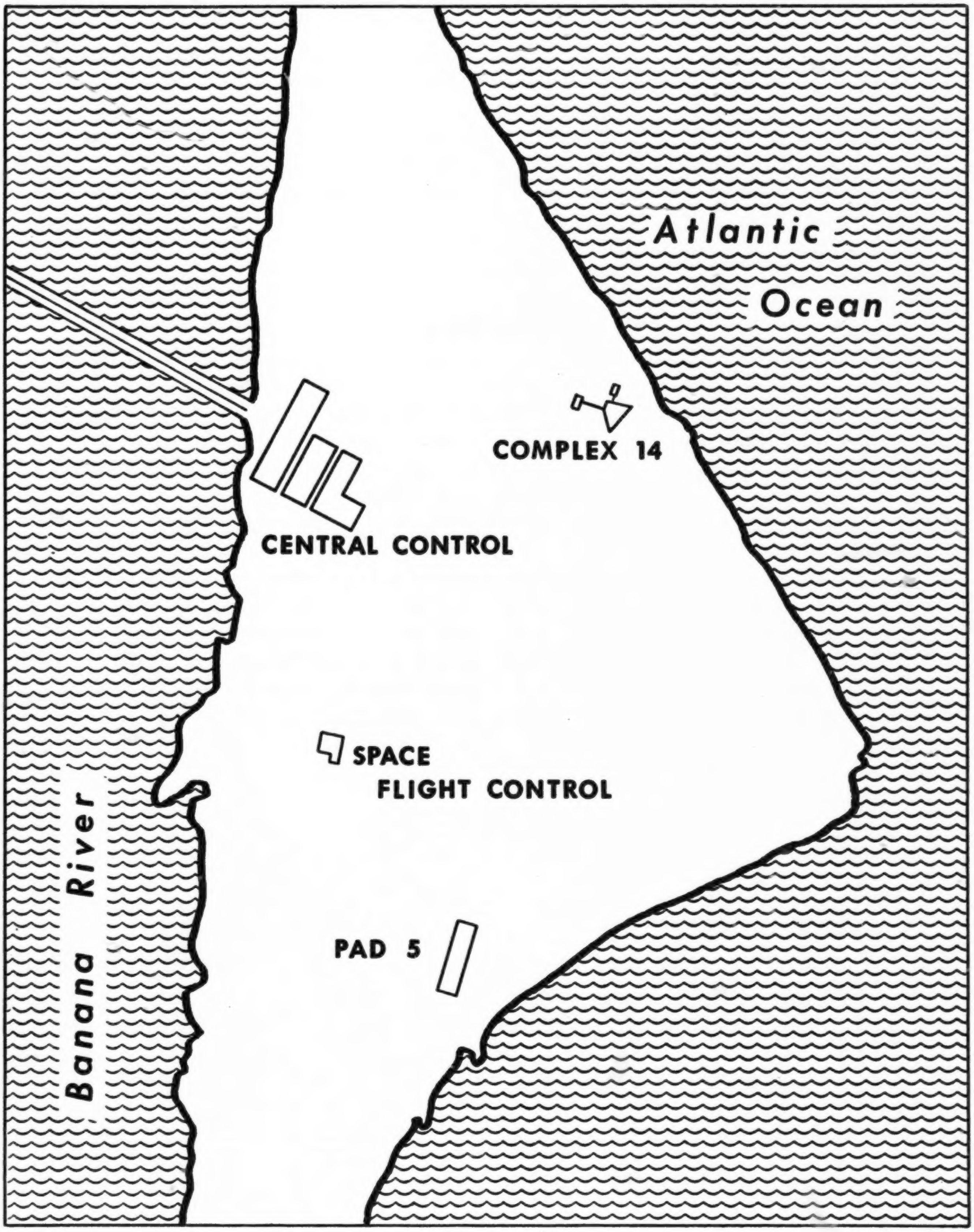


11–16.—Following the flight plan of SAC planes.

Category: Models

Cape Kennedy Display: Drawings, Directions

CAPE KENNEDY


Atlantic Ocean
COMPLEX 14
CENTRAL CONTROL
SPACE FLIGHT CONTROL
PAD 5
Banana River

ELEVEN YEARS

Models and Materials

Since the astronauts have used either the Atlas or the Redstone, it is suggested that the panorama show only one example of each. Plastic models of the Redstone are available from Revell Inc.—Kit H–1832, cost $.98. Models of the Atlas are also available from Revell Inc.—Kit H–1833, cost $2.49.

Other materials that would be necessary in making the proposed panorama are as follows:

Wrapping paper.—It should be at least 2 feet by 4 feet so that the models are not crowded. Also it should be heavy enough so that it does not wrinkle when painted.

Paint.

Construction

There are, of course, many different ways to construct the Cape Kennedy panorama. The following suggestions may serve as a guide for you in your planning. The only materials needed for this panorama are wrapping paper and paint. Choice of design and colors should be left to the originality of the students. The illustration will serve as an outline for drawing Cape Kennedy on the paper. Students may wish to consult other geographic sources to find more detailed information about the cape.

After the paint has dried, the base should be set upon a table and the rockets placed at their proper launching sites. Astronauts Shepard and Grissom were both launched by Redstone rockets with Mercury capsules from Pad 5 on Cape Kennedy. Astronauts Glenn, Carpenter, Schirra, and Cooper were all launched by Atlas rockets with Mercury capsules from Complex 14 on Cape Kennedy. If more than one model is used for each launching site they should be placed close together, so that students will be aware that the launching of each type rocket took place from only the two sites.

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Life Beyond the Earth, in the Vistas of Science series, published by Scholastic Press. Previously published in the same series: Spacecraft, and Challenge of the Universe.

List of Pamphlets, Brochures, and Kits

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